SCIENCE AND ART DEPARTMENT
OF THE COMMITTEE OF COUNCIL ON EDUCATION,
SOUTH KENSINGTON.

BETHNAL GREEN BRANCH OF THE SOUTH KENSINGTON MUSEUM.

INVENTORY

OF

THE FOOD COLLECTION.

ARRANGED IN

ALPHABETICAL ORDER.

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
FOR HER MAJESTY'S STATIONERY OFFICE.
1872.

Price Sixpence.

20800.

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ESTABLISHED in connexion with the Board of Trade in March 1853 as a development of the Department of Practical Art, which in 1852 had been created for the re-organization of Schools of Design. Placed under the direction of the Committee of Council on Education in 1856.

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THE BETHNAL GREEN BRANCH OF THE SOUTH KENSINGTON MUSEUM.

UNDER THE DIRECTION OF THE LORDS OF THE COMMITTEE OF COUNCIL ON EDUCATION.

LORD PRESIDENT, THE MARQUESS OF RIPON, K.G.
VICE PRESIDENT, THE RIGHT HON. W. E. FORSTER, M.P.

I. In tracing the origin of the Branch Museum of Science and Art at Bethnal Green it will be necessary to refer, though briefly, to the early days of the parent institution, at South Kensington, from whence a considerable portion of the new edifice and of its contents have been derived.

II. The South Kensington Museum stands on 12 acres of land, acquired by the Government at a cost of 60,000*l.*, being a portion of the estate purchased by Her Majesty's Commissioners for the Exhibition of 1851, out of the surplus proceeds of that undertaking.

III. Here, in 1855, a spacious building was constructed, chiefly of iron and wood, under the superintendence of the late Sir William Cubitt, C.E., at a cost of 15,000*l.*, intended to receive several miscellaneous collections of a scientific character mainly acquired from the Exhibition of 1851, and which had been temporarily housed in various places.

IV. In addition to the collections already alluded to, the whole of the Fine Art collections which had been exhibited at Marlborough House since 1852 was also removed thither, and this was supplemented by numerous and valuable loans by Her Majesty the Queen and others.

V. This building was opened on June 22nd, 1857, as THE SOUTH KENSINGTON MUSEUM. Although in many respects well suited to its purpose, this iron building was avowedly of a temporary character, and from the first it was intended to replace it by buildings of a more architectural character and of more substantial materials. The erection of these permanent buildings was commenced at once, and at the beginning of the year 1865 sufficient progress had been made to render the removal of the iron building necessary.

VI. It appeared to the Lords of the Committee of Council on Education that "this iron building might usefully be divided "into three portions, and that one of these portions might be "offered to the proper authorities in the north, east, and south "of London respectively, at a nominal sum, in order to assist "in the formation of district museums, security being required "for the completion of each portion in a suitable manner, and "for its permanent appropriation to public uses." After some correspondence with other Departments of the Government, it was decided that measures should be taken for carrying out this proposal.

VII. On May 6, 1865, a meeting of noblemen and gentlemen interested in the establishment of Suburban or Metropolitan District Museums was held at the South Kensington Museum, the Lord President of the Council, Earl Granville, being in the chair, at which the proposal was fully discussed, and a strong desire was expressed by the representatives of the various suburban districts of the north, east, and south of London to secure a share of this building, the great difficulty felt in each case being the providing of a suitable site. It was decided that after a period of six months each district should be at liberty to put in its claim to a portion of the iron building, and send its application to the Science and Art Department.

VIII. On March 7th in the following year (1866) Mr. now Sir Antonio Brady addressed the following letter to the Lord President of the Council:

Stratford, E., 7 March 1866.

May it please your Lordship,

WHEN I and others acting with me had the honour of attending the meeting held under your Lordship's presidency, in the Lecture Room of South Kensington Museum, on the 6th May last, on the subject of Local Metropolitan Museums, I put in a plea on behalf of the million artisans inhabiting the densely populated manufacturing and labouring districts in the East of London; and I pointed to a site most admirably placed in the very centre of the East-end, which I then hoped might be made available for the proposed museum.

The land in question, containing about 4½ acres, is close to Mile-end Station, one mile from Shoreditch on the Great Eastern Railway; it is near the junction of the Hackney and Cambridge Heath Roads, and is the centre of a network of railways, and omnibuses run in all directions, at twopenny and threepenny fares to and from all parts of London.

The site is about one mile and three-quarters from the Bank of England, and two miles from the General Post Office, and taking the

proposed site as a centre, within a radius of two miles are comprised a large portion of the following extensive districts, viz.: City of London, Shoreditch, Finsbury, St. Luke's, Old Street, Hoxton, Islington, De Beauvoir Town, Canonbury, Ball's Pond, Kingsland, Dalston, Clapton, Homerton, Hackney, Victoria Park, Old Ford, Bow, Stepney, Limehouse, Poplar (including West India Docks), parts of Rotherhithe and Bermondsey (including Surrey and Commercial Docks), Shadwell, Wapping, St. George's-in-the-East (including London and St. Katharine's Docks), Tower, Whitechapel, and Mile-end.

This circle of two miles radius embraces the N.E. and E. postal districts, part of the N. district, and parts of the E.C. and S.E. districts.

The land in question was bought as a gift to the poor in King James's reign, when this part of London was open fields, and the trustees, with the consent of the Charity Commissioners, have unanimously agreed to sell the land for the purposes of the proposed museum, and to invest the purchase-money, which has been conditionally offered and accepted.

I have now the pleasure of informing your Lordship that, if this site is acceptable to the Government, I am authorised, on the part of the committee acting with me, to guarantee to raise the purchase-money necessary to acquire the fee simple, and to offer this magnificent site to the Government for the purpose of erecting thereon a museum for the East-end of London.

The site is marked red in the accompanying maps, and is more particularly described in the plan hereunto annexed; it will be seen that it occupies a most commanding position. There is no other suitable spot unbuilt on, but if we had the choice of any ground in the East-end we should recommend the position of this site in preference to any other.

It is not my purpose to enter on the advantages of local museums. After what passed at the meeting at South Kensington, the value of institutions such as we wish to see established in the East-end is admitted on all hands; but what I desire respectfully to submit to your Lordship is the kind of museum which those acting with me would wish to see erected.

During the past year the subject of local museums has been much ventilated, and as the time has now arrived when it seems a necessity to provide more room for the great national collections, we respectfully submit that it is a good and fitting opportunity to make the national collections more useful and more accessible than they now are, and I trust this splendid site may induce the Government to entertain the propositions I have the honour to submit for their consideration.

1st. From inquiries made since the meeting last May, it is found that it will be utterly and entirely impracticable for a permanent building to be erected by local efforts, or to maintain the necessary staff if a building were otherwise provided; and we feel that this could only efficiently be done by the Government as a part of one comprehensive scheme. We find it will require all our efforts to raise the funds to pay for the

site, and under these circumstances we humbly submit to your Lordship that the Government should, in exchange for the site, take the whole matter into their own hands as a national affair.

2ndly. The scheme that commends itself most to our minds is, not to distribute the superfluities of the British Museum *piecemeal* amongst several local museums, but that typical collections illustrating one branch of science should be arranged in one of several museums in different quarters of the metropolis. The British Museum would thus be relieved of its plethora without impairing the value of any one collection; for instance, the natural history collections may be kept together in one place, the ethnological in another, so that anyone requiring to study any particular branch would know to what museum to resort.

In any plan of a museum that may be adopted for the improvement of the working classes, we submit that if they are to benefit by it to the fullest extent, it must be placed in a neighbourhood accessible to them, and must be open of an evening. We submit that it be made *educational in the widest sense of the word,* and that convenient and comfortable refreshment-rooms be added to the other attractions of the place.

I am to request that your Lordship will be pleased to communicate your wishes in this matter, that we, on our part, may at once take the necessary means to give legal effect to this arrangement, if concurred in by your Lordship.

The land being unoccupied would be available immediately the preliminary agreements were finally settled.

I have, &c.

(Signed) Antonio Brady, J.P.,
Honorary Secretary.

To the Right Honourable
Earl Granville, K.G., Lord President
of Her Majesty's
Most Honourable Privy Council.

IX. This letter was at once taken into favourable consideration by the Lords of the Committee of Council on Education, Earl Granville and Mr. Bruce being respectively President and Vice-President. A change of Government shortly afterwards took place which caused some delay, but on December 6, 1866, the Duke of Buckingham being President and Mr. Corry Vice-President, a minute was passed recommending the proposal to the favourable consideration of the Lords Commissioners of Her Majesty's Treasury, and asking that an estimate of the probable cost might be included in the votes of the ensuing year. The following paragraph occurs in this minute :—

"My Lords regret that Mr. Brady's offer on behalf of Bethnal Green can be adduced as the sole proof of the practical earnest-

ness of the several districts of the metropolis to act in establishing district museums. Their Lordships, therefore, propose that the iron columns, flooring, stairs, window fittings, heating arrangements, &c. of the whole of the iron building should be re-erected as soon as practicable at Bethnal Green, on the free site provided by the locality, but that brick walls and a slate roof should be used instead of iron; and they estimate that the cost will be 20,000*l.* The works would thus be of a permanent nature."

X. The Treasury (the Right Hon. B. Disraeli being then Chancellor of the Exchequer) accepted the proposal to re-erect the structure and to provide for its maintenance, and a vote of 5,000*l.* on account was granted by the House of Commons towards the cost of removal and re-erection of the building, but some delay arose in consequence of legal difficulties as to the conveyance of the ground. By the untiring efforts of Sir Antonio Brady, the Rev. Septimus Hansard, rector of Bethnal Green, Mr. J. M. Clabon, Dr. J. Millar, and others, heartily seconded by the trustees of the land and supported by the Government, these difficulties were at length surmounted, a special Act of Parliament having been obtained for the purpose (31 Vict. c. 8.), and on 13 February 1869, the four gentlemen above named, acting on behalf of the subscribers to the fund for the purchase of the site, attended at the Council Chamber, Downing Street, and presented to the Lord President and Vice-President of the Committee of Council on Education the title-deeds of the site.*

XI. After the removal of the materials had taken place the erection of the building was at once commenced in accordance with plans prepared for the Department of Science and Art under the direction of Major-General Scott, C.B.

XII. At the beginning of the present year (1872) the building was sufficiently advanced for the reception of objects. Two important collections, formerly exhibited in the iron buildings, already existed in the South Kensington Museum ready for transfer to Bethnal Green, the ANIMAL PRODUCTS COLLECTION, intended to illustrate the various applications of animal substances to industrial purposes, and the FOOD COLLECTION, one of the most popular divisions of the Museum. These, with an important series of examples of Economic Entomology recently formed by Mr. Andrew Murray, now occupy the whole of the

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* The whole of the official correspondence on the subject of the establishment of this Branch Museum has been printed as a Parliamentary Paper No. 218, session of 1872.

space on the ground floor under the galleries, and it is confidently believed that they will prove of great and abiding interest and educational value, forming as they do no inconsiderable contribution towards the establishment of a complete trade museum, the necessity for which at the East-end of the metropolis has long been recognized.

XIII. The galleries of the building on the first floor are at present assigned to Paintings and other Fine Art objects, and the Lords of the Committee of Council on Education are indebted to the generous liberality of Sir Richard Wallace, Bart., for the loan of a collection of Art Treasures of almost unexampled beauty and value, occupying the whole of the space assigned to this division. These Art Treasures, collected by the late Marquis of Hertford, K.G., during a period of 30 years, have hitherto been comparatively unknown to the English public, a large portion of the objects having been specially brought over from Paris within the last three months at the expense of Sir Richard Wallace.

XIV. The basement of the building contains a range of spacious and well-lighted rooms. A portion of this will serve as Refreshment Rooms, and it is proposed to use the remainder for educational purposes, including a Library, and rooms in which classes may receive instruction in the various branches of Science and Art.

XV. It was desired by Her Majesty the Queen that on the 24th June, 1872 the Museum should be opened in state by His Royal Highness the Prince of Wales on behalf of Her Majesty, the Prince being accompanied by Her Royal Highness the Princess of Wales.

HENRY COLE,
Director.

THE original idea of the Food Collection was suggested by Thomas Twining, Esq., of Perryn House, Twickenham, as part of a plan for the establishment of an Economic Museum for the working classes that should comprise illustrations of every-day life. It was first established and became part of the General Museum of the Science and Art Department at South Kensington in 1857, and for some time was under the scientific direction of Dr. Lyon Playfair, C.B., M.P., and afterwards of Dr. Lankester; and as now constituted, has been arranged with the express object of teaching the nature and sources of the food, which rich and poor alike need for the maintenance of their daily life.

Two great objects have been kept in view in the Collection: first, to represent the Chemical Composition of the various substances used as Food; and, secondly, to illustrate the natural sources from which the various kinds of Food have been obtained. Where the processes of the preparation of Food admit of illustration, these are also exhibited.

There are various methods by which such a Collection might be arranged, but the Chemical Composition of Food has been discovered to have so close a connection with its action on the system, that it has been deemed advisable to follow a chemical arrangement. All Food is found to be composed of the same materials or elements as the human body.

Advantage has been taken to incorporate in the present Alphabetical Inventory of the Food Collection much of the information contained in the Guide to the Collection (out of print), compiled by Dr. Lankester in 1863 for the Science and Art Department.

June, 1872.

The Food Collection is exhibited in the lower gallery on the North side of the Museum commencing at the Western end, and is arranged, as far as practicable, according to the following Classification :—

PHYSIOLOGICAL AND CHEMICAL CLASSIFICATION OF FOOD.

CLASS I.

ALIMENTARY OR NECESSARY.

				Examples.
GROUP 1.	Mineral substances - - - -			Water, common salt, the ashes of plants and animals.
GROUP 2.	Non-nitrogenous force-producing substances, incapable of forming flesh or muscle -	Force producers.	*a. Amylaceous.*	Sago, arrowroot.
			b. Saccharine.	Sugar, figs, dates.
			c. Oleaginous.	Animal and vegetable fats and oils.
GROUP 3.	Nitrogenous substances, capable of producing both flesh and force.	Flesh and force producers.	*a. Albuminous.*	Eggs.
			b. Fibrinous.	Wheat, flesh.
			c. Caseinous.	Peas, cheese.

CLASS II.

MEDICINAL OR AUXILIARY.

		Examples.
GROUP 1.	Containing Alcohol - - -	Beers, wines, spirits.
GROUP 2.	Containing Volatile Oils - - -	Spices and condiments, as cloves, nutmegs, pepper, horseradish, &c.
GROUP 3.	Containing Acids - - - -	Apples, oranges, rhubarb stalks, vinegar.
GROUP 4.	Containing Alkaloids, which act upon the nervous system as stimulants or sedatives.	Tea, coffee, cocoa, tobacco, hemp, opium.

INVENTORY

OF

THE FOOD COLLECTION.

ARRANGED

IN ALPHABETICAL ORDER.

(*Corrected to June* 1872.)

ACIDS (Case 23.) Organic acids enter extensively into the composition of various kinds of food. The acids most commonly used in diet are—Acetic acid, Citric acid, Tartaric acid, Malic acid, Oxalic acid.

As articles of diet they probably all act in the same manner on the system. They all exert a solvent power over mineral substances, and assist in carrying the alkalies and alkaline earths into the blood. There is also reason to believe that in certain states of the system they favour the development of the gastric juice in the stomach, and assist, by their decomposition, in oxidizing the materials of the blood. In all cases they act medicinally, or as auxiliaries, to the first class of foods.

Acetic Acid, or *Vinegar*, is obtained either from the oxidation of alcohol in fermented liquors, or from the distillation of wood. Common vinegar is obtained from the oxidation of the fermented wort of malt. Vinegar is added to sauces and food to give them a flavour. It also preserves vegetable substances from decomposition, and is used in the manufacture of what are called "Pickles."

Citric Acid is contained in many fruits, but it exists in greatest abundance and purity in the fruits of the Orange tribe (*Aurantiaceæ*), (*See* Case 17). Citric acid is separated from the fruits of these plants in a crystalline form.

Tartaric Acid is found in the juice of the fruits of the Vine tribe (*Vitaceæ*), more especially of the common Vine (*Vitis vinifera*). This acid gives the acidity to the fruit of the grape, and is the acid most commonly present in wines. It forms with potash a sparingly insoluble salt, known by the name of cream of tartar.

Malic Acid is contained in the fruits of the Rose tribe (*Rosaceæ*). It has the same general properties as the other acids, and is contained alone in apples and pears, whilst in cherries, plums, &c. it is mixed with other acids.

Oxalic Acid is contained in the Wood Sorrel (*Oxalis acetosella*), also in the common Sorrel (*Rumex acetosa*), and various species of Rhubarb (*Rheum*). Species of the latter genus are extensively cultivated in this country, and the petioles of their large leaves cut up and made into pies, puddings, &c.

Examples of the above-named acids are shown in the Case; also a series of specimens illustrating the manufacture of vinegar from Malt, presented by Messrs. Beaufoy, of South Lambeth.

Malt vinegar contains, besides acetic acid, water, dextrin, and frequently sulphuric acid. Wine vinegar contains, besides acetic acid, the constituents of the wine from which it is made, as tartaric acid, &c. Pure vinegar is transparent, but burnt sugar is added to give it a colour, on account of a popular prejudice in favour of coloured vinegar.

Various kinds of manufactured vinegars, English and Foreign, vinegar from the vinegar plant, pickled olives, onions, capers, chilies, capsicums, gherkins, rock samphire, West India pickles, and mixed pickles are likewise exhibited.

ACONITE ROOTS. (*See* NARCOTICS.)

ADULTERATION OF FOOD (Cases 87 and 88).

The extensive employment of various substances for the adulteration of food has led to the formation of a collection of those more commonly employed. In Cases 18 and 66 these substances are arranged according as they have been obtained from the animal, vegetable, or mineral kingdoms. They have been selected principally from the results obtained by Dr. Hassall, and made known in his work "On the Adulteration of Food." The object of adulteration appears to be threefold:—

1. By the addition of articles of inferior value to increase the bulk or weight of the article adulterated.
2. To improve the colour of the article sold, either by giving the adulterated article the appearance of a better article of the same kind, or of another article altogether.
3. To increase the taste and flavour by giving flavours to substances which they do not possess, or by increasing the flavour of an article weakened by adulteration.

The following is an alphabetical arrangement of the substances shown in the Cases, and more commonly used in adulteration:—

ANIMAL SUBSTANCES.

Bone Dust is obtained from the bone manufacturers, and is employed in the adulteration of pepper and sugar, and is also said to be added to flour.

Vegetable Substances.

Annatto is obtained from the seeds of *Bixa Orellana*. It is used for dyeing, and is itself extensively adulterated. In adulteration it is used for giving a deeper colour to milk and butter, and is also employed for colouring cheese.

Bay Leaves. The produce of the bay tree, *Laurus nobilis*. They are used in the adulteration of tea.

Beans roasted. The common horsebean is roasted, and used in the adulteration of coffee.

Burnt Sugar is made by exposing sugar to heat till the carbon is developed. It is known to those who use it for the purposes of adulteration as "Black Jack" and "Caramel." It is employed to give a deep colour to vinegar, rum, brandy, and sherry, principally in deference to public taste, which demands that these liquids shall be of a dark colour, although it is no proof of their value for the purposes for which they are used.

Capsicums. The fruit of the *Capsicum annuum*, which yields Cayenne pepper, is employed in the adulteration of gin. It is also added to powdered ginger and pepper.

Cardamoms. The seeds of the various kinds of cardamom fruits are added to gin, rum, and porter.

Catechu is the extract of the *Acacia Catechu* and other plants. It contains 70 to 80 per cent. of tannic acid, and is used to adulterate tea, tobacco, and opium.

Cayenne Pepper. (See *Capsicum*.)

Chamomile Flowers. The produce of the *Anthemis nobilis*. They have a pleasant, bitter, aromatic taste, and are added to beer.

Chicory is the root of the *Cichorium Intybus*. It is used to make a beverage by decoction. It is extensively added to coffee, both for the purposes of improving its flavour and adulteration.

Cocculus Indicus is the fruit of the *Anamirta paniculata*, and contains the poisonous principle, picrotoxin. These berries are used in the adulteration of beer and ardent spirits to increase their intoxicating power.

Coltsfoot. The leaves of *Tussilago Farfara* are employed in the adulteration of tobacco.

Coriander. The fruit of the *Coriandrum sativum* is used in adulterating beer.

Dandelion Roots. Chicory, which is employed to adulterate coffee, is itself adulterated with the roots of the *Leontodon Taraxacum*.

Gamboge is a gum resin exuded by the *Garcinia-cambogioides*, and other plants. It is a powerful medicine, and is used as a pigment, and in colouring confectionery yellow.

Gluten. This substance is separated from wheaten flour, and is employed in adulterating tea and coffee.

Grains of Paradise. Seeds of a species of *Elettaria*. They contain an acrid oil, and are added to beer and ardent spirits to give pungency and flavour.

Lentils. The seed of the *Ervum Lens*. They are added to farinaceous foods, and also employed to adulterate drugs.

Linseed Meal. The ground seeds of Flax (*Linum usitatissimum*). Used in adulterating pepper.

Liquorice. The sweet extract of the root of *Glycyrrhiza glabra*. It is used in the adulteration of porter and stout, which it sweetens, thickens, and blackens.

Logwood. The wood of the *Hæmatoxylon campeachianum*. It is used where a red colour is thought desirable, as in giving colour to inferior ports and clarets, bottled red fruits, &c.

Lupins roasted. The seeds of the *Lupinus* are roasted and added to coffee.

Nux Vomica. The seeds of the *Strychnos Nux Vomica* are very bitter, and contain the poisonous principle strychnine. They were formerly extensively employed to adulterate beer.

Opium. The juice of the *Papaver somniferum.* It has been added to beer to increase its intoxicating effect.

Pea-flour. Has been detected as an adulterator in pepper.

Potato-starch. The starch of the Potato is very frequently used to adulterate the higher priced starches or sago, tapioca, and arrow-root. It is also added to cocoa, honey, butter, lard, and many other things.

Quassia Chips. The wood of the *Quassia excelsa.* It is intensely bitter, and is used in medicine, but is added to beer to increase its bitterness. It is also used to adulterate snuff.

Radish Seed. It is used to adulterate mustard.

Rice in the husk. It is used in China to adulterate tea.

Rice-flour. Added to powdered pepper, mustard, liquorice root, ginger, currie powder, and mixed spice.

Roasted Corn. This is wheat roasted, and is sometimes used as a substitute for coffee, and also added to it for the purpose of adulteration.

Sago Meal is a cheap form of sago. It is used to adulterate cocoa, ginger, pepper, cinnamon powder, mixed spice, and annatto.

Sawdust. Employed in the adulteration of coffee, chicory, and spices.

Starch. Wheat starch is often employed for adulteration, and has been found in sugar, honey, butter, lard, arrow-root, confectionery, spice, carraway, and liquorice powder.

Sugar. It is extensively employed as an adulteration. It is added to honey, milk, porter, gin, rum, brandy, sherry, tobacco, liquorice.

Sumach is added to snuff.

Tobacco. It is added to beer to increase its intoxicating properties.

Treacle or Molasses. This is an impure, uncrystallized sugar, and is added to sugar, milk, sauces, porter, sherry, and tobacco.

Turmeric. It is a pungent yellow powder the produce of the *Curcuma longa.* It is added to substances to give a yellow colour. It is used in the adulteration of milk, mustard, cayenne, ginger, opium, rhubarb, liquorice, and confectionery.

Turnip. The root is cut up and substituted for orange peel in marmalade.

Valonea. The acorn cups of the *Balonia Oak* (*Quercus ægilops.*) Used for adulterating snuff.

Wheat-flour. Extensively used for adulteration in cocoa, honey, potted meats, mustard, pepper, ginger, sauces, cinnamon, liquorice, and various drugs.

Mineral Substances.

Acetate of Copper or *Verdigris.* This substance is found in pickles, as the result of adding copper to them for the purpose of giving them a green colour.

Alum. This substance is added to bread for the purpose of preventing an excessive fermentation, to which the inferior kinds of flour are liable. It also makes the bread white.

Antwerp Blue. A modification of Prussian blue, used in the colouring of confectionery.

Armenian Bole. This substance has a red colour, which depends on the oxide of iron it contains. It is added to cocoa, anchovies, potted

meat, and fish, and sauces, to give them a red colour. This adulteration is another instance of a substance added in deference to public taste. Many of the articles of diet to which the Armenian Bole is added, would be regarded as inferior without the colour which it produces.

Black Lead. This is Plumbago or Graphite. It is used for the purpose of giving a shiny facing to tea.

Blue John. This substance, more familiarly known as "Derbyshire spar," is a fluoride of calcium. It forms, when crushed, a white powder, which is extensively used for adulterating confectionery. It is also called "Daff."

Brickdust. The dust of both white and red bricks is used for adulterating various articles of diet, as chicory, cayenne pepper, cocoa, &c.

Brunswick Green. The true Brunswick Green is an oxychloride of copper. The false Brunswick Greens are mixtures of chromate of lead and indigo. They are used for producing various shades of green in confectionery, and are all poisonous.

Burnt Umber. An earth containing oxide of iron of a brown colour, employed for colouring confectionery, and adulterating tobacco and snuff.

Carbonate of Ammonia. This is "smelling salts." It is used by bakers, under the name of "Pop," for making their bread light.

Carbonate of Copper. It is employed for giving a green colour to green tea.

Carbonate of Lead. This compound is also employed for adulterating tea.

Chalk or *Carbonate of Lime.* It is employed for adulterating a variety of articles of food, as sugar, honey, potted meats, confectionery, liquorice, &c.

Chromate of Potash. It is said to be used in the adulteration of tea.

Chromate of Lead. It has a yellow colour, and is employed for adulterating mustard, cheese, and snuff, and for the colouring of confectionery.

Chrome Yellow is a pale variety of chromate of lead, and is used for colouring confectionery.

Daff. (See *Blue John.*)

Dutch Pink is a mixture of a yellow colouring matter with chalk. It is used as a facing for green tea.

Emerald Green. Known also as Scheeles Green. It is an arsenite of copper. It is used in colouring confectionery, and is a most virulent poison.

Felspar. It is used in China for adulterating tea.

Fuller's Earth. This compound consists of silica and alumina, and is used in the adulteration of tobacco.

Gypsum. (See *Plaster of Paris.*)

Lime, Carbonate of. (See *Chalk.*)

Magnesia, Carbonate of. This salt, as well as the Silicate of Magnesia (Steatite), are amongst the substances used for giving a facing to green tea.

Marble is a hard carbonate of lime, and when ground has been employed to adulterate sugar.

Pipe-clay is a compound of silica and alumina, and is mixed with honey for fraudulent purposes.

Plaster of Paris or *Gypsum.* It is sulphate of lime, and when crystallized is called *Selenite.* The powder is white. It is found in tea, potted meats and fish, in powdered mustard and pepper, and in confectionery. It is also used to give port wine a crust.

Prussian Blue. A compound salt of iron, potash, and cyanogen, used to give a facing to tea, and also to colour confectionery.

Red Lead is an oxide of lead, and is added to cocoa, cayenne, curry powder, confectionery, and snuff.

Red Ochre is a compound of oxide of iron with silicate of alumina and chalk. It has a red colour, and is used in the adulteration of cocoa, cayenne, tobacco, and snuff.

Common Salt is extensively employed as an adulterant. It is added to sugar, milk, bread, butter, cheese, lard, curry powder, sauces, gelatine, porter, tobacco, snuff.

Silica or *Silicic Acid*. This substance, which is almost pure in the flint, can be procured from its compounds in the form of a powder or a gelatinous mass. As a powder it is used in snuff, and as a gelatinous compound, in the adulteration of butter. Combined with potass it forms glass, and powdered glass is used to adulterate snuff, &c.

Smalts is a glass of cobalt, and has a blue colour. It is used to colour confectionery blue.

Steatite is a silicate of magnesia, and is used for giving a facing to green tea.

Sulphate of Copper, or *Blue Vitriol*. Like verdigris, is used for giving a green colour to pickles, bottled fruits, and preserved vegetables. It acts in the same way on bread as alum, and has been used for the purpose of whitening bread.

Sulphate of Iron, or *Green Vitriol* has been found amongst the adulterations used for the facing of green tea.

Sulphuric Acid, or *Oil of Vitriol*, is employed in the adulteration of vinegar, porter, and gin.

Ultra-marine. Employed in the manufacture of blue confectionery. Ultra-marine is obtained from Lapis Lazuli, in which it is native, and is a very costly pigment. An artificial ultra-marine is now manufactured and in general use, much lower in price, and of nearly equal value to the natural product.

Venetian Red is a red ferruginous earth, and is added to articles of food to improve their colour and to increase their weight. It has been found in ground coffee, chicory, tea, cocoa, anchovies, potted meat and fish, cayenne, cheese, and tobacco.

Verdigris. (See *Acetate of Copper*.)

White Clay. This substance is introduced into powdered mustard and confectionery.

Water. Very generally used, especially in the adulteration of milk, beer, wines, ardent spirits, sugar, tobacco, snuff, butter, &c.

ADULTERATION OF FOOD (Case 88). Series of experiments illustrating the use of red lead and starch in adulteration, with tests for same.

ADULTERATION OF FOOD (Case 88). Series illustrating the adulteration of pepper.

ADULTERATION OF MILK WITH WATER. (*See* MILK.)

ALBUMEN (*See* FLESH-PRODUCERS IN FOOD.)

ALCOHOL. (*See* DISTILLED SPIRITS.)

ALGÆ. (*See* SEAWEEDS USED AS FOOD.)

ALMONDS (Case 19). Fifty varieties of Almond cultivated in France.—Presented by M. de Bec, Aix, (Bouches-du-Rhone,) France.

ALUM. (*See* ADULTERATION OF FOOD.)

ANCIENT FOOD REMAINS. (*See* SWITZERLAND.)

ANIMAL FOOD. (*See* FLESH USED AS FOOD, FISH, MILK, &c.)

ANIMAL FOOD.* Substances illustrating the comparative chemical composition of 12 kinds of animal food, viz., cow's milk, beef, mutton, veal, pork, fowl, eggs, salmon, mackerel, soles, pigs' blood, and ox-bones. Showing the quantities of water, ashes, force-producers, and flesh and force-producers in each.

ARROWROOT. (*See* STARCH.)

ARTICHOKE. (*See* JERUSALEM ARTICHOKE.)

AURANTIACEÆ. (*See* ORANGES.)

AUSTRALIAN NATIVE BREAD. (*See* FUNGI.)

BANANAS. (*See* PLANTAINS.)

BARLEY. (*See also* CEREALS). (Case 28). *Substances illustrating the chemical analysis of one pound of Barley.*

Next in importance to wheat amongst the cultivated grains of this country is barley. The barley-plant, like wheat and oats, belongs to the natural order of grasses. This plant appears to be a native of Asia, but it has a remarkable power of adapting itself to a great range of temperature, and it has a wider distribution than either wheat or oats. The grain of the barley is used in this and other countries of the world for two purposes; first for food, and second for making beer and distilled spirits. As a food, barley is less rich in starch and nutritive matters than wheat. It contains a large quantity of mineral matter, and its meal makes agreeable cakes, which at one time were consumed largely as food by the population of Great Britain. Barley cakes are still eaten in Yorkshire; and the barley, deprived of its husks, is used in cookery under the name of "pearl barley." The great consumption of barley in this country is in the making of malt. In this process the barley is allowed to germinate; the starch of the seed is changed into sugar, which is subsequently converted into alcohol by fermentation in the manufacture of beer.

In chemical composition, barley and wheat are much alike; but barley does not form such a fine and spongy bread as wheat, although it is equally nutritive.

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* Not at present shown.

100 parts contain—

Water	14·0	Water	14·0
Gluten	12·8	Flesh and Force Producers	12·8
Starch	48·0	Force-producers	69·0
Sugar	3·8	Mineral matter	4·2
Gum	3·7		
Fat	0·3		
Woody Fibre	13·2		
Mineral matter	4·2		

The ingredients found in 1 lb. of Barley are shown as follows :—

a. *Barley—1 lb.*
b. *Pot barley obtained from 1 lb. of barley—11oz.*
1. Water in 1 lb. of barley—2 oz. 106 gr.
2. Gluten in 1 lb. of barley—2 oz. 22 gr.
3. Starch in 1 lb. of barley—7 oz. 297 gr.
4. Sugar in 1 lb. of barley—265 gr.
5. Gum in 1 lb. of barley—258 gr.
6. Fat in 1 lb. of barley—20 gr.
7. Woody fibre in 1 lb. of barley—2 oz. 50 gr.
8. Mineral matter in 1 lb. of barley—293 gr.

Barley (Case 28). Various preparations from barley are shown in the case, such as Scotch barley, pearl barley, barley-meal, barley semola from Tunis, and barley prepared for soup, also from Tunis.

Barley. The quantity of barley destroyed in producing the yearly average consumption of ardent spirits by each person in England. Calculated for the year 1856.

Beans (Case 30). *Substances illustrating the chemical analysis of one pound of field Beans.*

Although the various species of beans are more used for feeding the lower animals than as human food, they nevertheless contain a larger quantity of nutritive matter, in proportion to their weight, than any of the cereal grains. The form the protein assumes in beans is that of casein. When this substance is introduced into the stomach in an insoluble form, it appears to be much less digestible than either albumen or fibrin. This may account for the fact that the seeds containing this substance are not so generally used for human food as the grains of the Cerealia.

Beans, like other leguminous plants, are rich in flesh-formers; they therefore require to be mixed with a less nutritious substance to make them a wholesome diet. One hundred parts of field beans contain—

Water	14·8	Water	14·8	
Casein	24·0	Flesh and Force Producers	24·0	
Starch	36·0	Force-producers	57·7	Carbon 36·0
Sugar	2·0	Mineral Matter	3·5	
Gum	8·5			
Fat	2·0			
Woody fibre	9·2			
Mineral matter	3·5			

The ingredients in 1 lb. of field Beans are shown as follows:—

a. 1 *lb. of Field Beans.*
1. Water in 1 lb. of beans—2 oz. 161 gr.
2. Casein in 1 lb. of beans—3 oz. 368 gr.
3. Starch in 1 lb. of beans—5 oz. 333 gr.
4. Sugar in 1 lb. of beans—140 gr.
5. Gum in 1 lb. of beans—1 oz. 157 gr.
6. Fat in 1 lb. of beans—140 gr.
7. Woody fibre in 1 lb. of beans—1 oz. 206 gr.
8. Mineral matter in 1 lb. of beans—245 gr.

BEANS (Cases 119, 120, 122). Varieties of Beans cultivated in the following countries are exhibited in the case: Canada, Cochin China, Costa Rica, France, Great Britain, Gaboon, Hungary, India, Martinique, Peru, Réunion, Siam, Sicily, Spain, Styria, and Venezuela.

BEEF. (*See* FLESH USED AS FOOD.)

BEE-HIVES. (*See* HONEY.)

BEER (Case 35). The most common form in which alcohol is employed as a beverage in this country is that of Beer. Beer is distinguished from other alcoholic beverages by the addition of hops. These are the female catkins of the *Humulus Lupulus* (*See* Diagram), a plant which is extensively cultivated in this country. The case contains the materials from which porter is brewed, and in the jars will be found illustrated the changes which occur in the malt during its conversion into beer.

These specimens have been supplied from Messrs. Huggins and Co., Brewery, Broad Street, Golden Square, and are as follows:—

1. Dry yellow barley for malting.
2. Dry white barley for malting.
3. Barley in its first stage of conversion into malt. The barley is placed in a cistern and wetted, which makes it begin to grow; it is then placed on the malting floor, when it soon assumes the appearance shown in this example, and in its first stage of sprouting.
4. The malt six days old, when the sprout or acrospire is larger.
5. The malt ten days old, showing the still further growth of the acrospire.
6. The malt fourteen days old. It is now sufficiently sprouted, the starch of the barley being to a great extent converted into sugar by the action of a peculiar principle, called diastase, which is present in the grain.
7. Malt in a finished state. The malt having sufficiently sprouted, as in No. 6, is dried in a kiln, and is then in a state fit for brewing.
8. Crushed malt, ready for infusion in water.
9. Brewers' grains, or the malt exhausted of its valuable ingredients. Grains are used by dairymen for feeding cows and pigs, &c.
10. Hops from South and Middle Kent. These are added to the infusion of the malt.
11. Worcestershire hops.
12. Belgium hops used for making porter.

13. Spent hops. Hops after being boiled in the wort are used as manure.

14. Yeast. Yeast is added to the infusion, or wort, and causes it to ferment, and the saccharine matter to pass, more or less, into alcohol.

15. Roasted brown malt used for the darker ales.

16. Roasted malt used as the colouring matter for porter.

17. Isinglass dissolved in sour beer, used for the fining or clearing of ale or beer.

18. Fourpenny ale. The product of the previous processes.

19. London porter, which when stronger is called stout.

The quantities required to make three barrels of ale are as follows :—

1 quarter of malt.
8 lbs. of hops.
5 barrels (of 36 gallons each) of water.

In brewing, one barrel or 36 gallons is lost by evaporation, half a barrel or 18 gallons in the fermentation and racking, and half a barrel is absorbed by the grains.

The analyses of beer and ales are presented to the eye in the case.

An imperial pint of the beers named contains the following ingredients :—

Beers.	Water.	Alcohol.	Sugar.	Acetic Acid.
	ozs.	ozs.	ozs. grs.	grains.
London Stout - -	18½	1½	0 281	54
London Porter - -	19¼	¾	0 267	45
Pale Ale - - -	17½	2½	0 240	40
Mild Ale - - -	18¾	1¼	0 280	38
Strong Ale - -	18	2	2 136	54

Many other things besides malt are used for inferior beers, such as potatoes, beans, turnips, and other starchy foods. In Russia, rye furnishes *Quass* or rye beer. The Tartars and Turks make a beer from mares' milk called *Koumis*. In South America a beer is made from maize called *Chica*. Millet beers, made by the infusion and fermentation of millet seed, are largely used by the African nations.

BEET ROOT (Case 12). *Substances illustrating the chemical analysis of one pound of the common red Beet-root.*

The red beet-root when boiled or baked is an agreeable article of diet. It is sweet and not difficult of digestion. It contains a small quantity of flesh-forming matter, but more sugar than carrots or turnips. Sugar is made extensively from beet in France and Germany.

100 parts of red beet contain—

Water - - -	83·0	or,	WATER - -	83·0
Albumen and Casein	2·0		FLESH AND FORCE PRODUCERS -	2·0
Sugar - - -	10·0		FORCE-PRODUCERS	14·0
Woody fibre - -	3·0		MINERAL MATTER	1·0
Gum - - -	1·0			
Mineral matter -	1·0			

The constituents of one pound of red beet are shown as follows:—

a. 1 *lb. of red beet.*
b. 1 *lb. of red beet dried.*

1. Water in 1 lb. of red beet—13 oz. 124 gr.
2. Sugar in 1 lb. of red beet—1 oz. 262 gr.
3. Albumen and Casein in 1 lb. of red beet—140 gr.
4. Woody fibre in 1 lb. of red beet—210 gr.
5. Gum in 1 lb. of red beet—70 gr.
6. Mineral matter in 1 lb. of red beet—70 gr.

BEET-ROOT. Most plants contain sugar in their roots. But in some, large quantities are deposited, as in the Sugar Beet (*Beta vulgaris*), which is employed most extensively in France and on the continent of Europe for the supply of sugar for dietetical purposes. A series of specimens, illustrating various products, including Sugar, obtained from the manufacture of Beet-root, by Messieurs Serret, Hamoir, and Co., of Valenciennes, is exhibited in the Collection.

BEVERAGES (*See* BEER, DISTILLED SPIRITS, WINES.)

BIRDS USED AS FOOD. Next to the flesh of Mammalia that of Birds is most consumed as food by man. Several species are domesticated in this country, and used as food, whilst a large number of wild birds are consumed. About thirty species are thus commonly used in Great Britain. Upwards of 170 species have been recorded as eaten by man in various parts of the world.

The flesh of Birds has not been so carefully analysed as that of the Mammalia. It contains, generally, more of the principle *Kreatin*, and this is especially the case with wild birds. Young birds contain albumen and gelatine, whilst older birds contain fibrin. The flesh of birds contains but little fat; this is more especially the case in wild birds. Domestic fowls are fattened, more especially in the form of the capon. The goose and duck become fat by abundant feeding in domestication.

The flesh of Birds presents a greater variety of flavour than that of any other class of animals. These flavours are dependent on the presence in the flesh of compounds which are not well understood. As a rule, the flesh of carnivorous birds has a stronger flavour than that of those which are herbivorous or graminivorous.

The following are the principal Birds eaten in Great Britain, with the families to which they belong.

1. RASORES (*Scratchers*). The Common Fowl, the Pheasant, the Turkey, the Peacock, the Guinea Fowl, the Partridge, the Quail, the Red Grouse, the Ptarmigan, the Black Cock, the Capercailzie, the Pigeon.

2. INSESSORES (*Perchers*). The Rook, the Lark, the Wheatear, the Ortolan.

3. GRALLATORES (*Waders*). The Plover, the Sandpiper, the Peewit, he Curlew, the Snipe, the Woodcock, the Ruff, the Corn Crake, the Water Hen.

4. NATATORES (*Swimmers*). The Duck, the Teal, the Widgeon, the Grey Goose, the Wild Goose, the Brent Goose, the Soland Goose.

In illustration of "Birds used as Food," the following examples are exhibited:—

Case 63. Stuffed and mounted specimens of the varieties of Pheasant successfully introduced into this country:—

1. The common pheasant, a native of Asia Minor, and the first introduced into Europe.
2. The ringed pheasant, a native of China.
3. The parti-coloured pheasant, a native of Japan. Recently introduced. Breeds successfully with the other species.

Varieties and hybrids of the above are also shown in the case.

Case 64. A series of stuffed and mounted specimens of capercailzie, grouse, and ptarmigan.

Case 69. Stuffed and mounted specimens of some of the game birds of Nova Scotia, consisting of wood grouse, prairie grouse, ptarmigan, and American woodcock.—Presented by P. L. Sclater, Esq., Secretary to the Zoological Society of London.

BIRDS' EGGS. (*See* EGGS USED AS FOOD.)

BIRDS' NESTS. (*See* EDIBLE BIRDS' NESTS.)

BISCUITS (Case 27). A variety of steam-made biscuits manufactured from wheaten flour.—Exhibited by Messrs. Peek, Frean, and Co., Dockhead, Bermondsey.

Another series of samples of steam-made biscuits from wheaten flour.—Presented by J. W. Mackie and Sons, Steam Biscuit Factory, 108, Princes St., Edinburgh.

BONES USED AS FOOD (Case 62). *Substances illustrating the chemical analysis of one pound of Ox-bones.*

Bones consist principally of gelatin, fat, and mineral or earthy matters. They are consequently not very nutritious; but their constituents may be made to contribute to the value of soups and other articles of diet. Bonedust is sometimes used for making a jelly, and is a good method of introducing phosphate of lime into the system. The marrow of bones is principally fat. When bones are used for soup, they should be employed fresh, and crushed before they are cooked.

100 parts of ox-bones contain—

Fat - - - -	3·0	or,	Force-producers 3·0
Gelatin - - -	27·5		Flesh (?) and Force Producers - 27·5
Phosphate of lime -	57·6		Mineral matter 69·5
Fluoride of calcium -	2·7		
Carbonate of lime -	7·0		
Phosphate of magnesia	2·0		
Other salts - -	0·2		

The bones of other animals differ but little from those of the ox. The ingredients in 1 lb. of ox-bones are shown as follows:—

a. 1 *lb. of ox-bones.*
b. 1 *lb. of bone dust.*
1. Gelatin in 1 lb. of ox-bones—4 oz. 176 gr.
2. Fat in 1 lb. of ox-bones—210 gr.
3. Phosphate of lime in 1 lb. of ox-bones—9 oz. 93 gr.
4. Fluoride of calcium in 1 lb. of ox-bones—189 gr.
5. Carbonate of lime in 1 lb. of ox-bones—53 gr.
6. Phosphate of magnesia in 1 lb. of ox-bones—140 gr.
7. Other salts in 1 lb. of ox-bones—14 gr.

Bran. (*See* Wheaten Bran.)

Brandy. (*See* Distilled Spirits.)

Bread (Case 25). All food is called bread which is made from the flour of grains or seeds made into a dough and baked. Bread is either *vesiculated* or *unvesiculated.* The latter is called unleavened bread, and consists of such preparations of flour as are known by the name of biscuits and cakes.

Vesiculated bread is prepared in two ways, either by *fermentation* or *aëration.* In all cases fermented bread is made from the flour of wheat, or a mixture of this with the meal or flour of other grain. Oats, barley, maize, rye, will not alone make fermented bread. The meal of these grains is added to wheaten flour when they are made into bread.

In the making of fermented bread yeast is added to the flour, and the gluten of the flour is put into a state of change, and a little of it is decomposed. A small portion of the starch is formed into glucose, which is decomposed, and alcohol formed, and carbonic acid produced. The carbonic acid gas, escaping from the mass, vesiculates the bread. This process is called the *rising* of the bread. It is in this stage that the starch enters into a state of change which assists its subsequent solution in the stomach.

Bread is vesiculated, without being fermented, by two processes; 1, by the addition of substances which during their decomposition give out carbonic acid, as carbonate of soda and hydrochloric acid; 2, by making the bread with water charged with carbonic acid gas. The first is the process recommended by Dr. Whiting, and sold in London

under the name of "Dodson's Unfermented Bread." The second process consists in mixing water, containing carbonic acid gas under pressure, with flour, so that when the dough is baked the escape of the carbonic acid gas vesiculates the bread. This process is worked in London under Dr. Dauglish's patent, and is called "Aërated Bread."

Both forms of vesiculated bread are adapted for general use. In certain morbid conditions of the stomach, fermented bread undergoes changes which are productive of inconvenience, and which is prevented by unfermented bread.

The ingredients used in the above three processes of making wheaten bread are exhibited in the case, and are as follows :—

Ingredients in a 4 lb. loaf by the ordinary or fermented process

	lb.	oz.
Flour	3	2
Water	1	1½
Yeast	0	0½
Potatoes	0	1½
Salt	0	0½

Ingredients in a 2 lb. loaf by the aërated process :

	lb.	oz.
Flour	1	7
Water	0	10
Salt	0	0¼

Ingredients in two 4 lb. loaves by the unfermented process :

	lb.	oz.	gr.
Flour	7	1	0
Carbonate of soda	0	1	0
Muriatic acid	0	1	53
Water	2½ pints.		

One pound of the crumb of bread, if digested and oxidized in the body, will produce an amount of force equal to 1,333 tons raised one foot high. The maximum of work which it will enable a man to perform is 267 tons raised one foot high. One pound of crumb of bread can produce at the maximum $1\frac{7}{10}$ oz. of dry muscle or flesh.

BREEDS OF BRITISH OXEN. (*See also* FLESH USED AS FOOD.) A series of stuffed and mounted heads of some of the chief breeds of British Oxen. They are as follows :—Short Horn, Long Horn, Hereford, Devon, Galloway, Scotch Runt, and Polled Angus.

BREEDS OF CATTLE. Photographs of French breeds of oxen, sheep, and swine.—Presented by the French Commissioners, International Exhibition of 1862.

BRISBANE BOTANICAL GARDENS. (*See* MISCELLANEOUS.)

BRITISH WINES. (*See* WINES.)

BUCKWHEAT (Case 29). *Substances illustrating the chemical analysis of one pound of Buckwheat.*

Although in composition buckwheat (*Fagopyrum esculentum*) does not rank in nutritive value so high as wheat

oats, or barley, still its late sowing, rapid growth, and cheap cultivation render it a valuable plant.

100 parts contain—

Water	14·2	WATER	14·2
Gluten	8·6	FLESH AND FORCE PRODUCERS	8·6
Starch	50·0	FORCE-PRODUCERS	75·4
Gum	2·0	MINERAL MATTER	1·8
Sugar	2·0		
Fat	1·0		
Woody fibre	20·4		
Mineral matter	1·8		

The ingredients in 1 lb. of buckwheat are shown as follows:—

a. 1 *lb. of buckwheat.*
1. Water in 1 lb. of buckwheat—2 oz. 118 gr.
2. Gluten in 1 lb. of buckwheat—1 oz. 165 gr.
3. Starch in 1 lb. of buckwhat—8 oz.
4. Gum in 1 lb. of buckwheat—140 gr.
5. Sugar in 1 lb. of buckwheat—140 gr.
6. Fat in 1 lb. of buckwheat—70 gr.
7. Woody fibre in 1 lb. of buckwheat—3 oz. 114 gr.
8. Mineral matter in 1 lb. of buckwheat—126 gr.

BULLOCK'S TONGUE (Case 62). Modelled in wax. Exhibited for comparison with a horse's tongue, also modelled in wax and shown with it.

CABBAGES (Case 10). *Substances illustrating the chemical analysis of one pound of Cabbage.*

Cabbage, red cabbage, broccoli, Brussels sprouts. All these well-known articles of diet are cultivated varieties of the wild cabbage. They all contain a large quantity of water, and varying proportions of starch, dextrin, albumen, and woody fibre. In Germany the cabbage is converted into a universally popular article of diet, called "saurkraut," which is made by placing in a tub alternate layers of cabbage and salt. An acid fermentation ensues, which terminates at the end of a few days, when the vessels are made air-tight, and it is kept for use. It is usually eaten with animal food, especially pork.

100 parts of cabbage contain—

Water	93·4	WATER	93·4
Albumen	1·8	FLESH AND FORCE PRODUCERS	1·8
Starch	0·6	FORCE-PRODUCERS	4·0
Dextrin	2·9	MINERAL MATTER	0·8
Woody fibre	0·5		
Mineral matter	0·8		

The ingredients of one pound of cabbage are shown as follows:—

a. 1 *lb. of cabbage.*
b. 1 *lb. of dried cabbage.*
1. Water in 1 lb. of cabbage—14 oz. 414 gr.
2. Albumen in 1 lb. of cabbage—126 gr.
3. Starch in 1 lb. of cabbage—42 gr.
4. Dextrin in 1 lb. of cabbage—203 gr.
5. Woody fibre in 1 lb. of cabbage—35 gr.
6. Mineral matter in 1 lb. of cabbage—56 gr.

One pound of cabbage, when digested and oxidized in the body, will produce a force equal to 261 tons raised one foot high. The maximum amount of work which it will enable a man to perform is 52 tons raised one foot high. One pound of cabbage can produce at the maximum only 126 grs. of dry muscle or flesh.

CAROB BEANS (Case 13). *Substances illustrating the chemical analysis of* 1 *lb. of Carob beans.*

The legumes, or pods, of the *Ceratonia siliqua* are also known by the name of Algaroba, Locust beans, and St. John's bread. They contain a large quantity of sugar, and a considerable proportion of nutritive matter. The tree grows wild in Syria, and is used as food both by men and cattle on the Mediterranean.

100 parts of Carob beans contain—

Water	14·2	or,	WATER	14·2
Albumenoid matters	7·7		FLESH AND FORCE PRODUCERS	7·7
Sugar	54·0		FORCE-PRODUCERS	76·3
Fat	1·0		MINERAL MATTER	1·8
Gum	17·4			
Woody fibre	3·9			
Mineral matter	1·8			

The ingredients in 1 lb. of Carob beans are shown as follows :—

a. 1 *lb. of Carob beans.*
1. Water in 1 lb. of Carob beans—2 oz. 133 gr.
2. Albumenoid matters in 1 lb. of Carob beans—1 oz. 105 gr.
3. Sugar in 1 lb. of Carob beans—8 oz. 280 gr.
4. Fat in 1 lb. of Carob beans—70 gr.
5. Gum in 1 lb. of Carob beans—2 oz. 344 gr.
6. Woody fibre in 1 lb. of Carob beans—273 gr.
7. Mineral matter in 1 lb. of Carob beans—106 gr.

CARROTS (Case 11). *Substances illustrating the chemical analysis of* 1 *lb. of Carrots.*

The roots called "carrots" are frequently used as human food. They contain large quantities of water, and their most distinguishing dietetical substance is sugar, of which they contain nearly 6½ per cent.

100 parts of fresh carrots contain :—

Water	87·5	or,	WATER	87·5
Albumen and Casein	0·6		FLESH AND FORCE PRODUCERS	0·6
Sugar	6·4		FORCE-PRODUCERS	10·9
Fat	0·2		MINERAL MATTER	1·0
Gum	1·0			
Woody fibre	3·3			
Mineral matter	1·0			

The ingredients in 1 lb. of carrots are shown as follows :—

a. 1 *lb. of carrots.*
b. 1 *lb. of dried carrots.*
1. Water—14 oz.
2. Albumen and casein—42 gr.
3. Sugar—1 oz. 11 gr.
4. Fat—14 gr.
5. Gum—70 gr.
6. Woody fibre—231 gr.
7. Mineral matter—70 gr.

One pound of carrots, when digested and oxidized in the body, will produce a force equal to 322 tons raised one foot high. The maximum of work which it will enable a man to perform is 64 tons raised one foot high. One pound of carrots can produce at the maximum only 42 grs. of dry muscle or flesh.

CASEIN. (*See* FLESH-PRODUCERS IN FOOD.)

CELLULOSE. (*See* FORCE-PRODUCERS IN FOOD.)

CEREALS (Cases 118 to 128 inclusive). A collection of many of the varieties of wheat, oats, and barley cultivated in Great Britain, and various foreign countries. In the straw and ear, and also in grain. Mostly presented by Messrs. Peter Lawson and Son, Edinburgh and London.

CEREALS. (*See also* WHEAT, OATS, BARLEY, RYE, RICE.)

CHARCOAL BISCUITS (Case 22). Sample of biscuits made of wheaten flour and charcoal. Used for dietetic purposes. Presented by the maker, J. Bragg, 2, Wigmore Street, London, W.

CHEMICAL PRINCIPLES OF FOOD. (Case 3.) This is a series of chemical products obtained from plants used as food, as well as from animals, and presented by Messrs. Hopkin and Williams. They are as follows :—

Benzoic acid - -	An acid obtained from gum benzoin.
Cinnamic acid - -	An acid obtained from the bark of the cinnamon tree.
Lactate of lime - -	Lactic acid is produced by the decomposition of milk.
Malate of lime - -	Malic acid is found in unripe apples and other fruits.
Oxalic acid - -	This acid occurs in sorrel and rhubarb, and is made artificially by oxidizing sugar or sawdust.
Lupulin - - -	The narcotic principle of hops.
Glacial phosphoric acid	The phosphoric acid of bones, united with water.
Anhydrous phosphoric acid.	The acid of bones, free from water.
Racemic acid - -	Found in grapes, in some years in much greater quantities than in others.
Citric acid - - -	The acid of lemons.
Tartaric acid - -	Also found in grapes, and in combination with lime, constituting the crust of port wine.
Kreatin - - -	A crystalline body found in flesh, especially in that of skate, and in other fish.
Tannic acid - -	The tanning principle of oak bark, catechu, and other substances. It is very abundant in tea.
Amygdalin - - -	The chemical principle of almonds.
Asparagine - -	The crystalline principle of asparagus.
Berberine - - -	A bitter principle found in the barberry.
Caffeine - - -	The chemical principle of coffee, and identical with theine.
Theine - - -	The chemical principle of tea, and identical with caffeine.

Sugar of milk - -	Obtained, as its name implies, from milk.
Grape sugar - -	Found in grapes, but also made artificially from starch.
Pure morphia - -	One of the active principles of opium.
Nicotine - - -	One of the active principles of tobacco.
Narcotine - - -	One of the active principles of opium.
Piperine - - -	The active principle of pepper.
Pepsin - - -	A digestive principle of the stomach, now used with a favourable effect as a medicine.
Rheine - - -	The active principle of rhubarb.
Solanine - - -	A poisonous principle found in the potato and other plants of the same family.
Salicine - - -	The active principle of the willow.
Theobromine - -	The chemical principle of cocoa.
Hippuric acid - -	A constituent in the renal excretions of the cow.
Urea - - - -	One of the chemical principles of urine, but also formed artificially.
Uric acid - - -	A principle found in renal excretions, more especially in those of serpents.
Protein - - -	Mulder's basis of flesh-formers.
Aloin - - -	The bitter principle of aloes.

CHICK PEAS (Case 119). Samples from Moldavia, Turkey, Portugal, Spain, Upper and Lower Egypt, India.

The Chick Pea (*Cicer arietinum*) is a leguminous plant, the seeds of which are used especially in Spain as an article of diet. They are also eaten in the East. They are generally prepared simply by parching. Parched peas are as common in the shops of eastern countries as biscuits in England.

CHICORY (*Cichorium Intybus*). *See* ADULTERATION of FOOD.

CHINESE FOOD (Cases 72 to 78, inclusive). A series of food preparations from China, collected under the superintendence of the British Consul at Shanghae, and forwarded to the Museum by Sir John Bowring in 1858. It consists of wines and spirits, oils, confectionery, preserved fruits and vegetables, dried fruits and grains, tobacco, teas and flowers for scenting them, gelatinous substances, condiments and spices, pipes for tobacco and opium smoking, chopsticks, &c. &c. As this collection has a unity and completeness of its own, it was thought desirable not to separate it. It is, however, arranged as nearly as possible according to the general classification of the Food Collection. The following explanatory memorandum is extracted from the letter of advice received from the Consul with the collection:—

MEMORANDUM.

British Consulate, Shanghae, 5th Nov. 1858.

Case No. 1 contains a box with nine varieties of Chinese wine. These are the ordinary kinds in use in this part of the empire, and are chiefly distilled from different kinds of rice. The strongest and most common, Kow-liang, is procured in large quantities from Min-chwang, the port

in Manchuria to be opened by the treaty of Tiensin. Nos. 3 and 5 are perfumed with the Kwei-hiva and Moh-li-hwa, which flowers are also greatly used in the scenting teas and various kinds of preserves. Nos. 7, 8, and 9 are mixed with some medicinal preparations, and may be regarded more as liqueurs. No. 8, mixed with Gen-sing, is considered as very strengthening. The same box also contains a specimen of native soy, and four bottles of various kinds of oil. The first is vegetable oil in ordinary use here, both for culinary purposes and lamps; the second, made from the same bean that is used in the manufacture of soy; the third is rather expensive oil, made from a pea, and only used in culinary purposes; and, fourth, the tea-seed oil, greatly used, amongst other things, by women for dressing their hair. Also a tin box containing fourteen varieties of Chinese cakes; these are perishable, but as they are very inexpensive it was thought advisable to send a selection of them, as calculated to give a very good idea of the style of light confectionery amongst the Chinese. Various preserved fruits and vegetables in 31 sealed canisters; of these the Chinese have almost every possible variety, preserves of all kinds forming a great item in all their feasts. Here are fruits, flowers, roots, and vegetables preserved with sugar, salt, and treacle, many of them having no analogy to English preserves; in such cases only the Chinese name has been given. The San-cha and Yang-mei are very piquant and pleasant fruits, greatly used in confectionery and preserves, both by Europeans and natives here. With these are also six sealed canisters of sweatmeats, different preparations of sugar, treacle, and butter, not at all unlike those of England, either in manufacture or taste.

Case No. 2 contains 16 different Chinese tobaccos, numbered consecutively. These are from all districts, but most of them are procured from Han-kow, the new treaty port on the Yangtsze Keang, about 200 miles above Kingking. Many of them are native to that district; but Nankow also seems the emporium at which those of others are collected, and then distributed to the ports on the Yangtsze, almost every kind in Shanghae being procurable from there. The native names of all these varieties have been given, also the wholesale price per pecul at the largest tobacconists in this city. The pipes sent are all specimens of those in common use, indiscriminately by men and women. Sundry dried fruits and grains in boxes numbered from 1 to 15; amongst these will be found the Lichee and Longan, also several others from Tokien and Shantung provinces. No. 8 is the bean used in the manufacture of soy, and No. 13 the arrowroot from the root of the water-lily, large quantities of which are brought here from the Tae-hoo lake districts.

Teas, and the Flowers for scenting them.

This is not the season for procuring these. Mr. Fortune, who was last month in Shanghae, has promised his assistance in getting what is required at the right time. Amongst the few sent, numbered from 1 to 6, will be found three slabs of the brick tea. This principally comes from the province of Sze chuen. It is not used, and scarcely known in the southern parts of China. The lie or false teas are from the Canton province, and cannot be procured here at all. Nos. 5 and 6 are dried specimens of the Kuei-hwa and Môh-li-hwa, already mentioned, and greatly used for scenting teas. The flowers that are chiefly used for this purpose are the

Kwei-hwa,
Che-lan-hwa,
Môh-li-hwa (*Jasminii sp.*),
Mei-kwei-hwa,
Chang-kwei-hwa, and
Mei-hwa.

Gelatinous Substances.

Amongst these will be found three kinds of prepared seaweed, extensively used in Chinese cookery. Specimens of three kinds of glue (two being edible), fish-maws, Trepang, Beche-de-mer, and shark's fins are also here, and their wholesale prices at the large native dealers.

Sundries used as Food.

A few samples have been placed under this head. Nos. 1 and 2 are specimens of cinnamon and cassia buds from the Chekiang province. Nos. 3 to 7, various condiments, chiefly seeds used by Chinamen with their tea. Nos. 8, 9, and 10 are samples of the bamboo shoot, raw and preserved as a vegetable, in which form it is much used by the Chinese as a relish with their basins of rice.

Sundries not used as Food.

Chop-sticks. Those of red wood and ebony are in the commonest use, the ivory being used by the higher classes; whilst in the north especially, a pair of chop-sticks in a case with a knife is often suspended from the girdle. Of sandal-wood two specimens are enclosed. These are all imported from Singapore and the Straits, and much used by Chinamen for making the incense stick required for service in the temples. The sawdust, mixed with some chemical preparation, is also often used in scent bags, which hang as charms to the women's dresses.

Incorporated with the above is a somewhat similar collection from the district of Foo-chow-Foo. With the exception of a list, no description whatever was received with these examples.

CHOCOLATE. (*See* COCOA.)

COCO-NUT (Case 21). *Substances illustrating the chemical analysis of one pound of Coco-nut.*

The coco-nut is the seed or fruit of a species of palm (*Cocos nucifera*), which is found everywhere in tropical regions. Every part of the tree is useful to the natives of the country in which it grows. Sugar is made from its sap, the ripe seed is a wholesome food in the countries where it grows, and the juice contained in its interior is a cooling drink.

100 parts of the kernel of the coco-nut contain :—

Water	39·7
Albumen	0·5
Emulsin	1·1
Oil	29·3
Amygdalin	14·0
Sugar	3·6
Woody fibre	9·5
Gum	2·1
Mineral matter	0·2

or,

WATER	39·7
FLESH AND FORCE PRODUCERS	1·6
FORCE-PRODUCERS	58·5
MINERAL MATTER	0·2

Emulsin is regarded as a flesh and force producer, and amygdalin as a force-producer.

The constituents of one pound of the kernel of the coco-nut are shown as follows :—

a. 1 *lb. of coco-nut kernel.*

1. Water in 1 lb. of coco-nut kernel—6 oz. 149 gr.
2. Emulsin in 1 lb. of coco-nut kernel—77 gr.
3. Albumen in 1 lb. of coco-nut kernel—35 gr.

4. Oil in 1 lb. of cocô-nut kernel—4 oz. 303 gr.
5. Sugar in 1 lb. of coco-nut kernel—252 gr.
6. Amygdalin in 1 lb. of coco-nut kernel—2 oz. 106 gr.
7. Gum in 1 lb. of coco-nut kernel—147 gr.
8. Woody fibre in 1 lb. of coco-nut kernel—1 oz. 228 gr.
9. Mineral matter in 1 lb. of coco-nut kernel—14 gr.

COCO-NUTS from various countries. — Presented by Mr. Draper of Covent Garden Market.

COCO-NUT, the double.—Presented by Mr. Hawkins, Colet Place, Commercial Road, E.

The Double Coco-nut of the Seychelles Islands (*Loidicea Seychellarum*) contains sometimes as much as 14 pints of water, which is drunk by sailors touching on these islands with great relish.

COCO-NUT OIL. (*See* OLEAGINOUS FOOD.)

COCOA (Case 53). *Substances illustrating the chemical analysis of one pound of Cocoa paste.*

Cocoa is the seed of the chocolate plant (*Theobroma cacao*), a small tree with dark-green leaves, growing in Mexico, Carraccas, Demerara, and other places. It produces an elongated fruit in shape between a cucumber and a melon, which grows directly from the stem or main branches. The seeds or beans that afford the cocoa are imbedded in the fruit in rows in a spongy substance. When the fruit is ripe the seeds are taken out, cleaned, and dried, and sometimes a little fermented. The best cocoa is made from these seeds, which are shelled from the outer husks and then roasted. In the inferior kinds the shell is ground up with the seeds. Cocoa-nibs are seeds merely roasted and crushed after being shelled. Cocoa-paste is the seed ground down, and when this paste is mixed with sugar, and flavoured with aromatics, as vanilla, cinnamon, &c., it is called chocolate. The peculiar flavour of chocolate is due more especially to vanilla. (*See* VANILLA.) This latter substance is the fruit of the *Vanilla aromatica and V. planifolia*, an orchidaceous plant, a native of Mexico, and contains a volatile oil which gives the flavour to chocolate. Soluble, rock, flake, and other cocoas are the whole seeds ground and mixed with sugar, gum, starch, &c. Cocoa is a rich and nutritious food, containing in 100 parts, 51 of butter, 22 of starch and gum, 20 of gluten or flesh-forming matter, and about two parts of a principle called theobromine, to which no doubt its peculiar character is due; theobromine contains more nitrogen than theine, the active principle of tea and coffee.

Cocoa, though drunk like tea and coffee as a beverage, differs from them remarkably in composition. The distinguishing feature of its composition consists in the large quantities of fat and albumen which it contains; so that cocoa not only acts as an alterative through its theobromine, but as a flesh and force producing food.

100 parts of cocoa contain :—

Water	5·0
Albumen	20·0
Theobromine	2·0
Butter	50·0
Woody fibre	4·0
Gum	6·0
Starch	7·0
Red colouring matter	2·0
Mineral matter	4·0

or,

WATER	5·0
FLESH AND FORCE PRODUCERS	22·0
FORCE-PRODUCERS	69·0
MINERAL MATTER	4·0

The ingredients in 1 lb. of cocoa paste are shown as follows :—

a. 1 *lb. of cocoa nibs.*
b. 1 *lb. of cocoa paste.*

1. Water in 1 lb. of cocoa paste—350 gr.
2. Albumen and gluten in 1 lb. of cocoa paste—3 oz. 85 gr.
3. Theobromine in 1 lb. of cocoa paste—140 gr.
4. Butter in 1 lb. of cocoa paste—8 oz.
5. Gum in 1 lb. of cocoa paste—426 gr.
6. Starch in 1 lb. of cocoa paste—1 oz. 53 gr.
7. Woody fibre in 1 lb. of cocoa paste—280 gr.
8. Colouring matter in 1 lb. of cocoa paste—140 gr.
9. Mineral matter in 1 lb. of cocoa paste—280 gr.

One pound of cocoa nibs, when digested and oxidized in the body, is capable of producing a force equal to 4,251 tons raised one foot high. The maximum of work which it will enable a man to perform is 850 tons raised one foot high. One pound of cocoa nibs can produce at the maximum 3 oz. 85 gr. of dry muscle.

COCOA. A portion of the main stem of a Cocoa tree, also dried leaves and flowers, and a series of ripe pods or fruit, showing the seeds that afford the cocoa of commerce.—Presented by Messrs. Fry, of Bristol.

COCOA (Case 53). A variety of samples of raw cocoa, cocoa preparations, cocoa butter, cocoa pods, &c.—Presented by Messrs. Fry and Sons, Cocoa and Chocolate Manufacturers, Bristol.

COCOA (Case 53). A variety of samples of raw cocoa, cocoa butter, and preparations from cocoa.—Presented by Messrs. Dunn and Hewitt, 136, Pentonville Road, London, N.

COCOA (Case 53). Specimen of "Guarana," or Brazilian cocoa.

COFFEE (Case 50). *Substances illustrating the chemical analyses of one pound of Coffee.*

The coffee plant belongs to the natural order *Cinchonaceæ*, which contains the plants yielding quinine. It is

an evergreen shrub, with oval, shining, wavy, sharp-pointed leaves, white fragrant flowers, with projecting anthers, and oblong pulpy berries which are at first green, then of a bright red, and afterwards purple. Each berry contains two seeds, which are covered over with a tough membrane called "parchment." The seeds alone are used in the preparation of coffee. The coffee plant is indigenous in southern Abyssinia, where it grows wild over the rocky surface of the country. In the fifteenth century it was introduced into Arabia; in the sixteenth century into Constantinople; and in 1652 the first coffee shop was established in London. It is now cultivated in Ceylon, the East and West Indies, and in South America.

The coffee plant attains a height of from ten to fifteen, or twenty feet. It is planted in nurseries, and at the end of three years bears fruits and seeds, and continues to do so for twenty years. The seeds vary in size according to the countries in which they are produced. The best seeds are obtained from Yemen, the southernmost province of Arabia; these yield the richest Mocha coffee.

The separation of the seeds from the pulp and parchment of the fruit is a complicated process. The berries are first fermented, the pulp cleared away, and the seed dried in the parchment; the latter is afterwards bruised and separated from the seed, which is immediately placed in bags to render permanent the greenish colour that the unroasted coffee bean possesses. In its unroasted condition the bean consists of a horny mass, which, after it is submitted to roasting, yields very different products from those which existed before that process. Exposure to heat develops the peculiar volatile oil, and the astringent acid, on which the flavour of coffee depends. The oil acts as a stimulant upon the nervous and vascular system, producing an agreeable excitement of the mind, and a gentle perspiration on the skin. It also tends to impede the waste of the tissues of the body, and when taken in too large quantities produces sleeplessness and palpitation of the heart. The acid called caffeo-tannic, found in roasted coffee, acts as a light astringent; but in this respect coffee does not act so powerfully as tea. It contains the same active principle as that in tea, called *Caffeine*.

The chemical properties of the coffee-berry are altered by roasting, and it loses about 20 per cent. of weight, but increases in bulk one third or one half. Its peculiar aroma, and some of its other properties, are due to a small quantity of an essential oil, only one five-thousandth part of its weight, which would be worth about 100*l*. an ounce in a separate state. Coffee is less rich in CAFFEINE than tea is in THEINE, but contains more sugar, and a good deal of Casein.

One hundred parts consist of:—

Water	12·000	or,	Water - 12·00
Caffeine	1·750		Flesh and Force Producers - 14·75
Casein	13·000		Force-producers 66·25
Aromatic Oil	0·002		Mineral matter 7·00
Sugar	6·500		
Gum	9·000		
Fat	12·000		
Potash with a peculiar acid	4·000		
Woody Fibre	34·048		
Mineral matter	6·700		

The various ingredients in 1 lb. of coffee are shown as follows :—

a. 1 *lb. of roasted coffee berries.*

1. Water in 1 lb. of coffee—1 oz. 407 gr.
2. Caffeine in 1 lb. of coffee—122 gr.
3. Casein in 1 lb. of coffee—2 oz. 35 gr.
4. Aromatic oil in 1 lb. of coffee—1½ gr.
5. Gum in 1 lb. of coffee—1 oz. 192 gr.
6. Sugar in 1 lb. of coffee—1 oz. 17 gr.
7. Fat in 1 lb. of coffee—1 oz. 402 gr.
8. Potash, with a peculiar acid, in 1 lb. of coffee—280 gr.
9. Woody fibre in 1 lb. of coffee—5 oz. 262 gr.
10. Mineral matter in 1 lb. of coffee—1 oz. 31 gr.

Coffee. Branch of the coffee tree loaded with berries, two samples of raw coffee, and four photographs of the estates where the specimens were grown. From the Neilgherry Hills, Southern India.—Presented by J. Stanes, 4, Cullum Street, London, E.C.

Coffee (Cases 50 and 51). A series of raw coffees from Bombay, Cape Verde Islands, Yemen (Mocha), Colombo, St. Thomas, Madeira, Ceylon, Costa Rica, Madras, Mozambique, Angola, Bahia, Venezuela, Java, Sandwich Islands.

Coffee (Case 51). Raw coffee from the French colonies of Réunion, Martinique, Guiana, Guadaloupe, Gaboon, Senegal, Tahiti, Pondicherry, and Mayotte.

Coffee (Case 51). Samples of raw coffee from Java.—Presented by the Commissioners of the Netherlands at the International Exhibition of 1862.

Coffee Substitutes and Sophistications (Case 52). A large number of substances have been employed from time to time as substitutes for coffee, and prepared in the same way. They have none of them established themselves in public reputation, and are seldom sold. This is probably owing to the fact that they do not contain the principle theine, or any compound analogous to it.

The following substances are exhibited as coffee substitutes :—

Iris seeds, and coffee.
Broom seed, and coffee.
Fenugrec seed, and "Rosetta coffee."
Spanish acorns, and coffee.
Chick peas, and coffee.
Swedish coffee.
Rice, and coffee.
Carrot root, and coffee.
Parsnip root, and coffee.
Acorns, and "Hayet's" coffee.
Beans, and coffee.
Lupin seed, and coffee.
Chicory root, and coffee.
Dandelion root, and coffee.
Beetroot, and coffee.

COMPRESSED TEA and COFFEE. (*See* TEA and COFFEE.)

CONDIMENTS and SPICES (Cases 40, 41, and 43). There is a large class of substances which are added to food for the purpose of giving it flavour, and which, on account of the volatile oils they contain, act as stimulants. When taken into the stomach, like alcohol, they excite the mucous membrane and also stimulate the nervous system. These substances are known as Spices and Condiments. They also serve as the basis of a large number of the sauces which are sold prepared for the purpose of being added to cooked foods.

There is some difficulty in separating between Spices and Condiments, but the former are more generally eaten with sugar, the latter with salt.

In these Cases are exhibited samples of cloves, nutmegs, mace, cinnamon, ginger, pimento, carraway seeds, coriander seeds, cardamoms, turmeric, cassia bark, cassia buds, cumin seed, black pepper, white pepper, cayenne pepper, chilies, mustard seed, ground mustard. From various Countries. Some presented by Messrs. Fortnum & Mason.

CONDIMENTS and SPICES (Cases 41 and 42). A series of samples of various kinds of condiments and spices, the growth of the French Colonies of Réunion, Martinique, Guiana, Mayotte, St. Mary Madagascar, Guadaloupe, Gaboon, French East Indies, Cochin China, Tahiti, and Algeria, consisting of nutmegs, mace, cloves, cinnamon, allspice, cardamoms, ravensara fruit, capsicums, cayenne pepper, black pepper, ginger, turmeric root, curry powder, fennel seed, coriander seed, aniseed, cumin seed, vanilla pods, &c. &c.—Presented by the French Commissioners, International Exhibition of 1862.

CONDIMENTS and SPICES (Case 44). Samples of soluble condiments and spices prepared by MM. Lemettais and Boniére, Rouen.—Presented by Messrs. Fortnum and Mason.

CONDY'S FLUIDS, &c. Samples of the various fluids prepared by Messrs. Foote, Condy, and Co., of Battersea.

CONFECTIONERY (Case 88). Non-injurious coloring substances for sugar confectionery.—Presented by M. Ferré, Marylebone St., London, W.

CONFECTIONERY. (*See also* SUGAR.)

CRABS and LOBSTERS. (*See* CRUSTACEOUS ANIMALS USED AS FOOD.)

CROCODILE. A stuffed specimen of the common crocodile of Egypt. (*See* EGG CASE and REPTILES.)

CRUSTACEOUS ANIMALS USED AS FOOD (Case 59). The crustacea afford several species of edible animals, belonging to the groups of lobsters, crabs, prawns, and shrimps. Some of these are exhibited in the case. The following species of crustacea are among those commonly eaten in Great Britain :—the common crab, the shore crab, the lobster, the Norwegian lobster, the spiny lobster, the fresh-water cray-fish, the shrimp, the red shrimp, the prawn. Specimens of the spider crab, and of the land crab from Barbadoes, are also shown.

CUCUMBERS (Case 10). *Substances illustrating the chemical analysis of one pound of Cucumber.*

The cucumber, with the melon, vegetable marrow, and pumpkin, belongs to the gourd tribe (*Cucurbitaceæ*). These fruits are remarkable for the large quantities of water they contain, and the small quantity of force-producing and flesh-forming matters. Their rind or peel is hard and very indigestible.

100 parts of peeled cucumbers contain—

Water	96·2	or,	WATER	96·2
Albumen	0·2		FLESH AND FORCE PRODUCERS	0·2
Glucose	2·0		FORCE-PRODUCERS	3·1
Gum	0·5		MINERAL MATTER	0·5
Chlorophyl	0·1			
Woody fibre	0·5			
Mineral matter	0·5			

The ingredients in 1 lb. of peeled cucumbers are shown as follows :—

a. *Wax model of a cucumber.*
1. Water in 1 lb. of cucumber—15 oz. 173 gr.
2. Albumen in 1 lb. of cucumber—14 gr.
3. Glucose in 1 lb. of cucumber—140 gr.
4. Gum in 1 lb. of cucumber—35 gr.

5. Chlorophyl in 1 lb. of cucumber—7 gr.
6. Woody fibre in 1 lb. of cucumber—35 gr.
7. Mineral matter in 1 lb. of cucumber—35 gr.

CURRANTS. Bunches of a small species of grape (*Vitis vinifera*), the currants of commerce. From Cephalonia. Presented by the Commissioners for the Ionian Islands, International Exhibition of 1862.

CURRANTS. (*See* VINIFERÆ.)

DATES (Case 12). *Substances illustrating the chemical analysis of one pound of Dates.*

The fruit known as the date is the produce of a species of palm (*Phœnix dactylifera*), which grows chiefly in Syria, Arabia, Egypt, and the North of Africa. A considerable portion of the inhabitants of Egypt and Arabia subsist in a great measure on this fruit. The date palm has also many other uses.

100 parts of the date, without the stone, contain—

Water	22·4	or,	WATER	22·4
Albumen and Gluten	6·5		FLESH AND FORCE PRODUCERS	6·5
Sugar	50·3		FORCE-PRODUCERS	69·7
Fat	0·2		MINERAL MATTER	1·4
Gum	17·2			
Woody fibre	2·0			
Mineral matter	1·4			

The constituents of 1 lb. of dates are shown as follows :—

a. *1 lb. of dates.*
1. Water in 1 lb. of dates—3 oz. 257 gr.
2. Albumen in 1 lb. of dates—1 oz.
3. Gluten in 1 lb. of dates—18 gr.
4. Sugar in 1 lb. of dates—8 oz. 21 gr.
5. Fat in 1 lb. of dates—14 gr.
6. Gum in 1 lb. of dates—2 oz. 330 gr.
7. Woody fibre in 1 lb. of dates—140 gr.
8. Mineral matter in 1 lb. of dates—98 gr.

DEXTRIN. (*See* SUGAR.)

DIAGRAMS, TABLES, and DRAWINGS :

1. Physiological and chemical classification of food.
2. Diet table showing the comparative value of vegetable food.
3. Diagram showing the assumed average composition of entire carcasses of butchers' meat.
4. Diagrams showing the annual consumption per head of the population of certain countries named, of tea, sugar, and tobacco.

5. Series of coloured diagrams of various plants and fruits in illustration of the sources of sugar, starch, spices, condiments, &c. &c.
6. Seventeen small drawings, and coloured prints, of various fruits, spices, &c.—Presented by T. Twining, Esq.
7. Two diagrams of the microscopic structure of starches.
8. Four diagrams showing the microscopic structure of tobacco and adulterated tobacco.
9. Four diagrams of the anatomy of the working bee.—Exhibited by Mr. Marriott.
10. The anatomy of the common oyster.
11. Twelve drawings, by a Chinese artist, of the cultivation of the tea plant, manufacture, packing, and transport of tea.
12. Two drawings showing the construction of Ransome's patent filters.
13. A series of photographs of microscopic drawings, by Mr. Rochfort Connor, in illustration of the adulteration of various alimentary substances.
14. Table showing the more important articles of food and drink, and the substances employed in adulterating them.—By Wentworth L. Scott, Esq.
15. The original condition of the garden cabbage, brocoli, cauliflower, &c., also the wild state of the common carrot.—Purchased of the artist, Mr. Worthington G. Smith, F.L.S.
16. A series of engravings representing the microscopic appearance of impurities in various waters.
17. Diagram in the French language, with engraved figures, illustrating the operations of Apiculture.—Presented by M. H. Hamet.
18. Diagram of a distillery on M. Le Play's system, for extracting sugar from the sugar millet.
19. Coloured drawing or diagram of the Fecula manufactory belonging to M. Ch. Planque, Pont St. Maxence, France.
20. Chart of the wine district of the Department of the Gironde, France.
21. Table showing the fluctuations in the price of wheat from the year 1858 to the present time.
22. Anatomy of the tape-worm. (*See* DISEASED MEAT.)
23. Large diagram of the apparatus for converting sea-water into aërated fresh water, according to Dr. Normandy's process.—Presented by the late Dr. Normandy.

24. A series of 40 drawings of British edible and poisonous Fungi. (*See* Fungi.)

Dietaries. (*See* Public Dietaries.)

Dika Bread (Case 21). *Substances illustrating the chemical analysis of one pound of Dika bread.*

A bread is made at Gaboon in Africa from the seeds of the *Mangifera Gabonensis,* called Dika or Odika bread, a specimen of which, presented by Mr. P. L. Simmonds, is exhibited. By simple boiling in water, from 70 to 80 per cent. of fat can be extracted from this bread. In this respect the seeds resemble chocolate, and it is not impossible that they might be used in Europe in the same way. They are exceedingly abundant in Gaboon. When used by the natives of Africa it is scraped and put into their stews. It cost in Gaboon about 3*d.* or 4*d.* a pound.

The ingredients in 1 lb. of Dika bread are shows as follows :—

a. *Piece of dika bread.*
1. Water in 1 lb. of dika bread—350 gr.
2. Albumen and gluten in 1 lb. of dika bread—1 oz. 228 gr.
3. Fat in 1 lb. of dika bread—10 oz. 215 gr.
4. Starch in 1 lb. of dika bread—1 oz. 263 gr.
5. Gum in 1 lb. of dika bread—182 gr.
6. Woody fibre in 1 lb. of dika bread—210 gr.
7. Mineral matter in 1 lb. of dika bread—302 gr.

Specimens of the fruit or nuts, kernels, fat, and bread, from the French colony of Gaboon, Central Africa, are exhibited in the case.

Diseased Meat (Case 62). Model in wax of a piece of diseased pork called "measled pork." One of the most curious and important results of recent investigation into the natural history of the common tape-worm, is the discovery that it is produced in the majority of cases by eating measled pork, the pig swallowing the eggs of tape-worms in its food. (See printed label accompanying the model.)

Diseased Meat (Case 62). Tape-worm from a human being, and a tape-worm taken from an ox.

Distilled Spirits (Cases 38 and 39). When wines or other fermented liquors are submitted to heat, the alcohol distils over and may be collected in a receiver. The product is called *distilled spirits.* The alcohol is not, however, pure, but mixed with water. It is difficult to procure alcohol pure. A spirit having a density of ·920 is called *proof spirit* in this country ; and when distilled spirits contain

more or less alcohol than this they are said to be *under* or *above* proof.

Gin is obtained from fermented grain, to which the berries of the Juniper are added to give it a flavour. Other flavouring substances are employed, as cinnamon, cloves, &c., for what is called "Cordial Gin." The words Gin and Geneva are a corruption of *Genièvre*, French for Juniper.

Whisky is distilled from grain, and has a slight smoky flavour which gives it its peculiar taste.

Rum is distilled from fermented sugar and molasses in the West Indies. Its peculiar odour depends on butyric ether, and a flavour is sometimes given by the addition of pine apples.

Brandy is distilled from wine, and its peculiar flavour depends on the addition of peach kernels to the liquid whilst distilling. It also contains œnanthic and acetic ethers.

Arrack is obtained from fermented rice, betel-nuts, or the sap of the various species of palm.

Potato-Brandy is made by converting the starch of the potato into glucose, and then fermenting and distilling.

Liqueurs are spirits distilled from various substances which give their peculiar flavour, and to which a considerable quantity of sugar is added.

The analysis of an imperial pint of *Brandy, Rum*, and *Gin*, is shown in the case :—

	Water.	Alcohol.	Sugar.	
	oz.	oz.	oz.	gr.
Brandy - -	9½	10½	0	80
Rum - - -	5	15	0	0
Gin (best) - -	12	8	0	0
Gin (retail) - -	16	4	½	0

The following samples of distilled spirits are also exhibited :—orange alcohol, alcohol from the cashew nut, apricot alcohol, alcohol from Jerusalem artichokes, alcohol from sugar millet, alcohol from potatoes, arrack from the East Indies, alcohol from cider, alcohol from cider lees, alcohol from maize, alcohol from honey, and alcohol from starch refuse. Also a variety of flavoured spirits and liqueurs mostly from the French colonies of Réunion, Martinique, and Guiana.

DISTILLED SPIRITS (Case 102). Examples of distilled spirits from new or unusual sources, rendered potable by a patent process.— Presented by the patentee, Mr. H. Eschwege.

DISTILLED SPIRITS (Case 38). Japanese spirit or liqueur, distilled from rice, called "Soke" or "Saki." A portion is in the original porcelain jar in which it was received.— Presented by Her Majesty the Queen.

DRAWINGS. (*See* DIAGRAMS.)

Drawings of British Fungi. (*See* Fungi.)

Dried Fruits. (*See* Fruits preserved without the aid of Sugar.)

Edible Birds' Nests (Case 79). Examples of these edible nests are exhibited in the case. They are from the following countries, namely:—China, Cochin China, Siam, Borneo, Java, Réunion, and the Philippine Islands. Also two specimens of the swallow which forms the nest.

These nests are formed by swallows of the genus *Hirundo* frequenting the islands of the Eastern Archipelago, and are gathered from caverns and sides of rocks on the sea-shore. They are eaten, dissolved in rich soups, and are esteemed a great delicacy by the Chinese, who give large prices for them. Examples of the nests in a natural state and also cleaned for culinary purposes are exhibited.

Economic Entomology as applied to Food and Forestry.

This collection is placed at the eastern end of the gallery, and is contained in thirty-one glazed cases. There are also forty-one framed diagrams and drawings belonging to it. The series is intended to illustrate the ravages of insects injurious to food substances, or noxious to man, domestic animals, &c. Also such as are destructive to timber, or otherwise exemplifying the Science of Forestry. Formed and arranged by Andrew Murray, Esq., F.L.S.

Eggs (Case 61). *Substances illustrating the chemical analysis of one pound of Hens' Eggs.*

The eggs of birds form a very important part of the food of man. A variety of specimens, chiefly from domestic poultry, are shown in the cases. The eggs of various species of birds are used as food. They consist of four distinct parts:—1. A hard external envelope called the shell, 100 parts of which consist of 90 parts of carbonate of lime, five of phosphate of lime, and five of organic matter. 2. A thin membrane which lines the shell internally. 3. A glairy transparent liquid, called the "white" (so called because it coagulates and becomes white when heated) of the egg. 4. A central mass of a yellow colour, called the "yolk," or yelk. A good sized hen's egg weighs about 1,000 grains, in the following proportions: white 600 grains, yolk 300 grains, shell and membrane 100 grains. Eggs are very nutritious articles of food. They contain as much oil or fat and flesh-forming matter as butchers' meat. The white is not, however, so digestible as the flesh of meat. All birds' eggs

may be eaten with impunity. The eggs of the crocodile and other oviparous reptiles are eaten in some parts of the world.

The average weight of a hen's egg, shell and all, is about two ounces. The following is the composition of 100 parts of the white and yolk of hen's eggs:—

White.

Water - - - -	85·0
Albumen - - - -	12·0
Extractive matter - - -	2·7
Mineral matter - - -	0·3

Yolk.

Water - - - -	53·28
Albumen - - - -	17·47
Oil or Fat - - - -	28·75
Mineral matter - - -	·50

One pound of eggs, out of their shells, contains:—

	oz.	gr.
Water - - - - - -	12	66
Albumen - - - - -	2	0
Extractive matter - - - -	0	130
Oil or Fat - - - - -	1	214
Mineral matter - - - - -	0	28

One pound of hard boiled eggs, if digested and oxidized in the body, will produce a force equal to 1,415 tons raised one foot high. The maximum amount of work which it will enable a man to perform is 283 tons raised one foot high. Under similar circumstances 1 lb. of white of egg will only produce force equal to 357 tons raised one foot high, and enable a man to perform work equal to 71 tons raised one foot high; whilst 1 lb. of yolk of egg developes a force of 2,051 tons raised one foot high, and will enable a man to perform work equal to the raising of 410 tons one foot high. Finally, 1 lb. of eggs can produce at the maximum 2 oz. of dry muscle or flesh.

In the case are exhibited the eggs of various breeds of domestic poultry; also of the swan, pheasant, pea-fowl, partridge, plover, redshank, snipe, pigeon, turtle dove, heron, moor-hen, guillemot, emu (presented by Mr. W. J. Black, of Liverpool), ostrich (presented by Mr. Peacock, of Berwick St., Soho), and of the crocodile.

Eggs (Case 98*a*). Patent egg tester, for readily ascertaining if eggs are fresh or not.—Exhibited by the inventor, Mr. Schäfer, 6, Golden Square, London, W.

Eland, The (*Oreas Canna*). This animal belongs to the group of antelopes, and is by far the largest species of the family. It is a native of South Africa, where its flesh is more prized than that of any other wild animal. The eland is susceptible of domestication, and they have frequently been tamed and bred at the Cape and other parts of Africa.

In 1835 the then Earl of Derby commenced an attempt at breeding a herd in this country. He succeeded, and in 1851 the herd was transferred to the gardens of the Zoological Society of London, from whence they have been supplied to several gentlemen, who are now successfully rearing an increased number of these animals. Some of the English bred elands have been killed and eaten, and the flesh has been pronounced tender, very full of flavour, and superior to that of any of our present domesticated animals. The fat is equal to the best beef fat, whilst the flavour of the meat is said to resemble that of the pheasant. The head of this animal is exhibited by Mr. W. Childerhouse, 11, Conduit Terrace, Westbourne Terrace, W.

ENTOMOLOGY as applied to FOOD and FORESTRY. (*See* ECONOMIC ENTOMOLOGY.)

EQUIVALENTS OF FOOD (Case 32). The contents of this case illustrate the quantities required, for one day's food, of various vegetable substances containing the same supply of nitrogen.

1.	Wheat flour	2 lbs.	1 oz.
2.	Barley meal	2 lbs.	6 oz.
3.	Oatmeal	1 lb.	13 oz.
4.	Maize	2 lbs.	9 oz.
5.	Rye	2 lbs.	3 oz.
6.	Rice	4 lbs.	13 oz.
7.	Buckwheat	3 lbs.	10 oz.
8.	Lentils	1 lb.	3 oz.
9.	Peas (dry)	1 lb.	5 oz.
10.	Beans (dry)	1 lb.	5 oz.
11.	Potatoes	20 lbs.	13 oz.
12.	Carrots	31 lbs.	4 oz.
13.	Parsnips	15 lbs.	10 oz.
14.	Turnips	17 lbs.	13 oz.
15.	Cabbage	10 lbs.	6 oz.
16.	Tea (dry)	1 lb.	11 oz.
17.	Coffee (dry)	2 lbs.	1 oz.
18.	Cocoa (nibs)	1 lbs.	8 oz.
19.	Bread	3 lbs.	13 oz.

ERGOT OF RYE (Case 124). Rye is subject to a fungus which changes the character of the grain, which is then called "ergot of rye." It is used as a medicine, and when eaten in food it produces poisonous effects upon the system.

ESSENCES (Case 44). (*See also* FLAVORERS.)

Various samples of artificial fruit and other essences.—Presented by Messrs. Foote, Condy, and Co., Battersea.

ESSENCES (Case 44). Essential oils (for flavoring, &c.) of red, white, and wild thyme, caraway, fennel, sage, anise,

and peppermint.—Presented by Messrs. Boyer, Heyl, and Co., Gignac, France.

FARINACEOUS PREPARATIONS FROM FRANCE (Case 106). A series of samples, manufactured by M. Groult, of Paris, consisting of sago, arrowroot, semolina, pastes, tapioca, polenta, maccaroni, vermicelli, sweet chesnut flour, lentil flour, &c. &c.

FIBRIN. (*See* FLESH-PRODUCERS IN FOOD.)

FIGS (Case 13). *Substances illustrating the chemical analysis of* 1 *lb. of dried Figs.*

Dried figs contain a large quantity of grape sugar. They also contain a sufficient quantity of nitrogenous organic matter to render them a nutritious article of diet.

100 parts of dried figs contain :—

Water - -	16·3
Gluten - -	6·0
Glucose - -	60·5
Starch - -	3·0
Dextrin - -	1·0
Woody fibre -	10·6
Fat - - -	0·9
Mineral matter -	2·0

or,

WATER - -	16·0
FLESH AND FORCE PRODUCERS -	6·0
FORCE-PRODUCERS	76·0
MINERAL MATTER	2·0

The ingredients in 1 lb. of dried figs are shown as follows :—

a. 1 *lb. of dried figs.*
1. Water in 1 lb. of figs—2 oz. 254 gr.
2. Gluten in 1 lb. of figs—420 gr.
3. Glucose in 1 lb. of figs—9 oz. 328 gr.
4. Starch in 1 lb. of figs—210 gr.
5. Dextrin in 1 lb. of figs—70 gr.
6. Fat in 1 lb. of figs—63 gr.
7. Woody fibre in 1 lb. of figs—1 oz. 263 gr.
8. Mineral matter in 1 lb. of figs—140 gr.

Fresh figs contain 66 per cent. of water, or about 10 ounces in the pound.

FILTERS. (*See also* WATER.) The following Filters are exhibited in the Museum :—

"*Poor Man's Filter.*"—Constructed by using a common flower-pot, plugging the hole at the bottom with a piece of sponge (not too tightly), and then putting a layer of animal charcoal, another of clean sand, and a third of rather coarse gravel.

Patent Filters.—Exhibited by Lipscombe and Co., 93, Regent Street.

"Automaton" and "Ascension" Filters.—Exhibited by Ransome and Co., Cannon Row, Westminster.

Compressed Carbon Filter.—Exhibited by Messrs. Atkins and Son, 62, Fleet Street.

Ornamental porcelain table Filter.—Presented by Messrs. Gillet and Brianchon, Rue Fénélon, Paris.

Fish used as Food (Case 57). *Substances illustrating the chemical analysis of one pound of various sorts of Fish.*

Fishes yield a larger number of species used as food by man than either birds or quadrupeds. There are but few fishes caught in the fresh waters and seas of Great Britain that may not be eaten with impunity. The flesh of some fish is poisonous, and upwards of 20 species are known that possess poisonous qualities. In some countries the only animal food known is fish.

The flesh of fish contains less nitrogenous matter than that of birds or mammals. It also usually contains less oil or fat, and a larger quantity of mineral matters. The digestibility of the flesh of fish is not so great as that of meat; hence generally fish is not so nutritious as the flesh of birds or quadrupeds. The muscles of fish contain, in small quantities, a principle called *Kreatin*, which also exists in human muscles. Fish is undoubtedly a valuable as well as an agreeable article of diet, and should, where possible, be introduced into all dietaries.

One pound of whiting, if digested and oxidized in the body, will produce a force equal to 491 tons raised one foot high. The maximum of work which it will enable a man to perform is 98 tons raised one foot high.

One pound of mackerel, when digested and oxidized in the body, produces a force equal to 1,000 tons raised one foot high. The maximum amount of work which it will enable a man to perform is 200 tons raised one foot. One pound of mackerel can produce at the maximum 3¾ oz. of muscle or flesh. Most of the other descriptions of fish are intermediate between whiting and mackerel in force-producing constituents. Fish oils are very rich in force-producers; 1 lb. of cod-liver oil, if digested and oxidized in the body, will produce a force equal to 5,649 tons raised one foot; the maximum amount of work which it will enable a man to perform being 1,130 tons raised one foot high.

The consumption of fish in London is very large. The great market for them is Billingsgate. The following table* of the annual sale of fish at this market will give some idea of their enormous consumption in London:—

	Millions.	Tons.	Value.
			£
Herrings, in bulk	1,050	112,500	1,500,000
„ 250,000 barrels	175	18,750	175,300
Plaice, 1 lb. each	34	15,000	90,000
Soles, ¼ lb. each	98	12,000	20,000
Mackerel, 1 lb. each	24	10,500	130,000
Cod, 10 lbs. each	½	1,785	5,000
Sprats	Countless	1,780	12,000
Salmon	½	1,555	124,000
Eels	10	—	26,000

* The date of this table is 1863. It will be revised in a subsequent edition.

The chemical analysis of 1 lb. of salmon, mackerel, sole, conger eel, pike, and herring, may be seen in the case as follows :—

	In 1 lb. of Salmon.	In 1 lb. of Mackerel.	In 1 lb. of Sole.	In 1 lb. of CongerEel.	In 1 lb. of Pike.	In 1 lb. of Herring.
	oz. gr.	oz. gr.	oz. gr.	oz. gr.	oz. gr.	oz. gr.
Flesh, including fibrin, albumen, and gelatin.	2 43	3 387	1 350	3 233	3 23	1 270
Fat - - -	0 301	1 56	0 14	0 350	0 42	1 60
Mineral matter -	0 387	0 57	0 136	0 84	0 91	0 145
Water - -	12 143	10 374	13 374	11 208	12 281	12 400

Fish (Case 58). Mounted specimens of some of the commoner sorts of fish brought to the London markets, such as mackerel, haddock, whiting, plaice, herring, flounder, carp, pike, roach, tench, dace, eel, &c.

Fish (Case 67). A male salmon from the river Severn, stuffed and mounted.—Presented by Frank Buckland, Esq.

Fish. Cast, in plaster, of a full-grown salmon from the Galway fisheries, Ireland. Painted in natural colours.—Purchased of the artist, Mr. W. H. Briscoe.

Fish. Three specimens of salmon trout from the river Severn. Presented by Frank Buckland, Esq.

Fish. Fine specimen (female) of the common roach, from a pond in Sussex. Weighed 1 lb. 10 ozs.

Fish. Various samples of dried fish, &c., such as capelins, herrings, cods' tongues, shrimps, prawns, "tripangs," &c. from the French colonies of St. Pierre, Tahiti, and Cochin China.

Fish. The Bummeloh Fish (*Saurus Ophiodon*). This fish, which is widely distributed over the Chinese Seas and Indian Ocean, belongs to the Salmon family. It is eaten when dried and salted, and has then a strong flavour, resembling mouldy cheese. It is very delicate when eaten fresh, and is known in Bengal under the name of "Bombay ducks."

Fish-hatching. A set of earthenware boxes, or troughs, in illustration of the method of artificially hatching out the ova of salmon and other fish, with an explanatory label.

Flavorers (Case 44). There is a class of substances which cannot be called either condiments or spices, and which are nevertheless extensively employed to render the taste

of food more agreeable. Of these the following may be mentioned :—

1. Oil of bitter almonds. Both bitter and sweet almonds are produced by the same species of plant (*Amygdalus communis*), and yield a bland fixed oil, known as oil of almonds. The flavor of the bitter almond is dependent on a volatile oil, which is found in the kernel of the peach, the leaves of the laurel, and other plants belonging to the almond tribe. This volatile oil is used to flavour cakes and custards, and in perfumery. The flavour of this oil is closely imitated in two substances, known by the name of *nitro-benzol* and *benzonitrile.* Nitrobenzol is obtained by the action of nitric acid upon one of the constituents of coal tar, and is sold under the name of artificial oil of bitter almonds, and *essence de mirbane.* Benzonitrile is obtained by the distillation of hippuric acid, a substance contained in the urine of cattle. The oil of bitter almonds and its substitutes are all poisonous, and should be added to food with care.

2. Vanilla. This highly-prized flavourer of chocolate is the produce of the *Vanilla aromatica;* a plant belonging to the natural family *Orchidaceæ.* It grows in South America, and was used by the Mexicans to flavour their cocoa. It is not only used for this purpose at the present day, but is extensively employed to flavour various kinds of food, ices, creams, coffee, and even tea. About 5 or 6 cwts. of vanilla are annually imported into this country.

3. Lemon, orange, and citron peel. The rind of the fruit of all the plants belonging to the orange tribe contains receptacles which are filled with volatile oil. These oils are distilled, and sometimes sold separate for dietetical purposes. The recent and dried peels are also used for flavouring purposes. Preserved in sugar and acid, lemon and orange peel are eaten under the name of " chips." All are eaten preserved in sugar, moist, under the name of " candied " peel.

4. Artificial fruit essences. One of the most interesting discoveries of modern chemistry is the nature of those essences which give the various flavours to fruits. These have been so skilfully imitated in the laboratory of the chemist that they are extensively employed to flavour confectionery, &c. Of those the best known are the following :—

a. Pear oil, or essence of Jargonelle pears. This is a spirituous solution of the acetate of the oxide of amyl or potato ether. It is used for making pear drops, which consist of barley sugar and a very small quantity of this solution.

b. Apple oil is the valerate of amyl. It is employed largely by the confectioners.

c Grape oil and cognac oil are also a compound of potato ether with acids, and are used to give flavour to the low-priced brandies.

d. Pine apple oil is a compound of common ether with butyric acid, the substance which gives the rancid odour to kept butter. It is used extensively for flavouring rum, and making pine apple ale. Butyric acid and propylic ether also produce a fine pine apple flavour.

Many other flavourers have been manufactured in the same way, and a variety of artificial flavourers thus made are employed by the makers of cheap confectionery.

Examples of the above may be seen, including also very fine specimens of vanilla from the French colonies of Réunion, Guadaloupe, and Guiana.

FLESH-PRODUCERS in FOOD (Case 4). The examples illustrate those ingredients of food which are capable of forming

muscle or flesh. They are made use of in the human body partly for the construction of muscle, and partly for the production of mechanical force and heat. They are all nearly identical in their chemical composition.

1. *Albumen,* made from eggs and from blood. It forms about 7 parts in 100 of blood, and is always present in lymph and chyle. Liquid or soluble albumen, as shown in the white of egg, coagulates by heat and various chemical agents.

2. *Albumen,* as found in the juices of carrots, turnips, and cabbages, and obtained by boiling their juices. It is the same body as albumen from eggs.

3. *Fibrin,* made by stirring blood with a rod. It is the basis of muscle or flesh. Flesh-fibrin probably bears the same relation to blood-fibrin as coagulated albumen does to soluble albumen.

4. *Fibrin,* made from wheat-flour. It is identical with the fibrin found in flesh, but not exactly the same as that found in blood, and is known as *gluten.*

5. *Casein,* prepared from milk, in which it is soluble, owing probably to a little alkali; when an acid is added the casein curdles or coagulates, and then is known as cheese. In 100 parts of cows' milk there are 5 parts of casein.

6. *Casein* or *legumin,* as found in peas, beans, lentils, coffee, &c. The casein of vegetables is now supposed by most chemists to be identical with the casein or cheese of milk, but a few chemists still deny this. 100 parts of peas contain above 20 parts of casein.

FLESH USED AS FOOD (Case 56). These illustrations are intended to exemplify the quantities of possible flesh-formers, force-producers, and mineral matters in the most common forms of animal food. Although the flesh of animals does not in many instances contain, bulk for bulk, more nitrogenous or nutritive matter than vegetable food, its flesh-forming constituents are found to be more easily digestible.

The following table gives the composition in 100 parts of veal, beef, mutton, and pork :—

—	Mineral Matter.	Gelatin.	Fibrin and Albumen.	Fat.	Water.	Total.
Veal	4·5	7·5	9·0	16·5	62·5	100·0
Beef	5·0	7·0	8·0	30·0	50·0	100·0
Mutton	3·5	7·0	5·5	40·0	44·0	100·0
Pork	1·5	5·5	4·5	50·0	38·5	100·0

The composition of 1 lb. of beef, mutton, pork, veal, lamb, and fowl may be seen in the case, and is as follows :—

——	Beef. 1 lb. contains		Mutton. 1 lb. contains		Pork. 1 lb. contains		Veal. 1 lb. contains		Lamb. 1 lb. contains		Fowl. 1 lb. contains	
	oz.	gr.	oz.	gr.	oz.	gr.	oz.	gr.	oz.	gr.	oz.	gr.
Water - -	8	0	7	16	6	69	10	0	8	44	12	107
Gelatine - -	1	62	1	52	0	385	1	82	0	400	1	52
Fibrin and Albumen - -	1	122	0	385	0	315	1	199	0	360	2	104
Fat - - -	4	340	6	176	8	0	2	281	5	263	None.	
Mineral Matter -	0	350	0	245	0	105	0	312	0	244	0	174

1 lb. of the lean of beef, if digested and oxidized in the body, will produce an amount of force equal to 885 tons raised one foot high. The maximum of work which it will enable a man to perform is 177 tons raised one foot high. 1 lb. of the lean of beef can produce at the maximum 2⅓ oz. of dry muscle or flesh. 1 lb. of beef fat can, under the same circumstances, produce an amount of force equal to 5,626 tons raised one foot high; and it will enable a man to perform work amounting in the maximum to 1,125 tons raised one foot high, but it can produce no flesh or muscle.

Under the same circumstances 1 lb. of the lean of veal will produce a force equal to 726 tons raised one foot high, and it will enable a man to perform work amounting in the maximum to 145 tons raised one foot high. The maximum amount of dry muscle which can be produced from 1 lb. of the lean of veal is 2½ oz.

1 lb. of the lean of boiled ham, if digested and oxidized in the body, will produce a force equal to 1,041 tons raised one foot high, and will enable a man to perform work amounting in the maximum to 208 tons raised one foot high.

These analyses have been founded on the large table exhibited in the Museum (*see* DIAGRAMS), and which has been drawn up from original experiments by Messrs. Lawes and Gilbert.

FOLIAGE of various plants, namely:—tea, cocoa, coffee, Paraguay tea, cinnamon, allspice, black pepper, cassia, nutmeg, and clove. From the Royal Gardens, Kew. Renewed from time to time.

FORCE-PRODUCERS IN FOOD.—Both the heat force and the mechanical force generated in the bodies of animals are derived from food. An animal, however high its organization may be, can no more *generate* an amount of force capable of moving a grain of sand, than a stone can fall upwards, or a locomotive drive a train without fuel. All that such an animal can do is to liberate that store of force which is locked up in its food. It is the *chemical change* which food suffers in the body of an animal that liberates the previously pent-up forces of that food, which then make their appearance in the form of heat and mechanical motion.

All the combustible ingredients of food, whether nitrogenous or not, are capable of yielding mechanical force and heat force; but the nitrogenous constituents, such as albumen, fibrin, and casein, can also be used in the body for the building up of muscle or flesh, hence these constituents are termed *flesh and force producers.* The non-nitrogenous ingredients of food, such as starch, sugar, and fat, are incapable of forming flesh; they are *force-producers* only. It is the oxidation of the non-nitrogenous matters in the body which constitutes the chief source of muscular power. The muscular force expended within the body takes the form of heat, and is the chief if not the only source of animal heat.

The following table exhibits the results of actual experiments made to ascertain the maximum amount of force produced by 1 lb. of various articles of food when oxidized in the body:—

Name of Food.	Tons raised One Foot high.	Name of Food.	Tons raised One Foot high.
Cod-liver oil - -	5,649	Bread crumb - -	1,333
Beef fat - -	5,626	The lean of boiled ham -	1,041
Butter - -	4,507	Mackerel - -	1,000
Cocoa nibs - -	4,251	The lean of beef -	885
Cheshire cheese -	2,704	The lean of veal -	726
Oatmeal - -	2,439	Guinness's stout -	665
Arrowroot - -	2,427	Potatoes - -	618
Flour - - -	2,383	Whiting - -	491
Pea-meal - -	2,341	Bass's ale - -	480
Ground rice - -	2,330	Apples - - -	400
Gelatin - -	2,270	Milk - - -	390
Lump sugar - -	2,077	White of egg - -	357
Yolk of egg - -	2,051	Carrots - - -	322
Grape sugar - -	2,033	Cabbage - -	261
Hard-boiled egg -	1,415		

The maximum amount of *mechanical work* which 1 lb. of each of the above substances can enable a man to perform (external work) is about one-fifth of the amount mentioned in the above table.* The following tables further illustrate the application of these experimental data:—

* It is not to be understood from this that taking 1 lb. of cod-liver oil would enable a man to lift one-fifth of 5,649 tons (that is, 1,130 tons) one foot off the ground. What is meant is, that that is the total mechanical work which the combustion in the body of 1 lb. of the oil is capable of producing outside the body, supposing its effect to be wholly expended in the production of this mechanical work without any *waste*. Moreover, this statement of the amount of work in tons lifted one foot does not take *time* at all into account. It simply reckons the total work which it is possible to get out of the combustion of 1 lb. of cod-liver oil, no matter how long it may take to do it.

WEIGHT and COST (1869) of various ARTICLES of FOOD required to be oxidized in the Body in order to raise 140 lbs. to the height of 10,000 feet.

External work = $\frac{1}{5}$th actual energy.

Name of Food.	Weight in lbs. required.	Price per lb.	Cost.
		s. d.	s. d.
Cheshire cheese - - -	1·156	0 10	0 11½
Potatoes - - - -	5·068	0 1	0 5¼
Apples - - - - -	7·815	0 1½	0 11¾
Oatmeal - - - -	1·281	0 2¾	0 3½
Flour - - - - -	1·311	0 2¾	0 3¾
Pea-meal - - - -	1·335	0 3¼	0 4½
Ground rice - - - -	1·341	0 4	0 5½
Arrowroot - - - -	1·287	1 0	1 3½
Bread - - - - -	2·345	0 2	0 4¾
Lean beef - - - -	3·532	1 0	3 6½
„ veal - - - -	4·300	1 0	4 3½
„ ham, boiled - - -	3·001	1 6	4 6
Mackerel - - - -	3·124	0 8	2 1
Whiting - - - -	6·369	1 4	9 4
White of egg - - - -	8·745	0 6	4 4½
Hard-boiled egg - - -	2·209	0 6½	1 2½
Isinglass - - - -	1·377	16 0	22 0½
Milk - - - - -	8·021	5*d.* per quart.	1 3½
Carrots - - - - -	9·685	0 1½	1 2½
Cabbage - - - -	12·020	0 1	1 0¼
Cocoa-nibs - - - -	0·735	1 6	1 1¼
Butter - - - - -	0·693	1 6	1 0½
Beef fat - - - -	0·555	0 10	0 5½
Cod-liver oil - - - -	0·553	3 6	1 11¼
Lump sugar - - - -	1·505	0 6	1 3
Commercial grape sugar - -	1·537	0 3½	0 5½
Bass's pale ale (bottled) - -	9 bottles.	10*d.* per bottle	7 6
Guinness's stout - - -	6¾ „	10*d.* per bottle	5 7½

WEIGHT of various ARTICLES of FOOD required to sustain RESPIRATION and CIRCULATION in the Body of an average Man during 24 hours.

Name of Food.	Weight in ozs.	Name of Food.	Weight in ozs.
Cheshire cheese - -	3·0	Whiting - - -	16·8
Potatoes - - - -	13·4	White of egg - - -	23·1
Apples - - - -	20·7	Hard-boiled egg - -	5·8
Oatmeal - - - -	3·4	Gelatin - - - -	3·6
Flour - - - -	3·5	Milk - - - -	21·2
Pea-meal - - - -	3·5	Carrots - - - -	25·6
Ground rice - - -	3·6	Cabbage - - -	31·8
Arrowroot - - -	3·4	Cocoa-nibs - - -	1·9
Bread - - - -	6·4	Butter - - - -	1·8
Lean beef - - -	9·3	Cod-liver oil - - -	1·5
„ veal - - -	11·4	Lump sugar - - -	3·9
„ ham, boiled - -	7·9	Commercial grape sugar -	4·0
Mackerel - - -	8·3		

The case (No. 4) shows some of the varieties of *force-producers* found in food.

1. *Cane Sugar*, found largely in the cane, but also in beetroot, carrots, turnips, potatoes, &c.

2. *Fruit Sugar* is an uncrystallizable sugar found in fruits, and abundantly in molasses; it is less sweet than cane sugar.

3. *Grape Sugar* is the sugar found in dried figs, raisins, &c. It crystallizes, but is much less sweet than cane sugar, of which 1 lb. equals 2½ lbs. of grape sugar.

4. *Milk Sugar* is a crystallizable sugar found chiefly in the milk of vegetable feeders, but also in the milk of carnivora. It is even less sweet than grape sugar.

5. *Starch*, as obtained from the potato and other vegetables. The granules differ in size in various kinds of food, but the chemical composition is not different except in the case of the dahlia, chicory, &c., which contain *Inulin*, a peculiar variety of starch.

6. *Gum* is found in the juices of almost all plants. In gum Arabic it is nearly pure. Linseed, quince-seed, &c., contain a modification of gum called mucilage, or *Bassorin*, which softens but does not dissolve in water.

7. *Pectin*, found in turnips, carrots, parsnips, pears, apples, &c., is a kind of gummy or gelatinous substance, and is similar to other substances known as vegetable jelly, pectic acid, &c.

8. *Cellulose, or Woody Fibre*, forms the ground-work of all plants, and is the same in composition though variable in texture. Cotton and linen are nearly pure cellulose.

9. *Fat*, being rich in carbon and hydrogen, is a powerful force-producer though it is doubtful whether it is so easily combustible in the body as starch or sugar. It plays an important part in the animal economy, and is found in all food. Fats of a like kind exist both in animals and vegetables.

FORESTRY. (*See* ECONOMIC ENTOMOLOGY.)

FRUITS (Case 89). Models of various tropical fruits, such as the bread-fruit, mango, plantain, pomegranate, guava, tamarind, pine-apple, forbidden fruit, oranges, &c.

FRUITS preserved by the aid of sugar. (*See* PRESERVED FRUITS.)

FRUITS preserved without sugar. (*See* PRESERVED FRUITS.)

FUNGI (Case 34). The group of Fungi contains a number of plants which are eaten as food, whilst a large number of them act as virulent poisons. Those which are edible

contain varying quantities of starch, sugar, woody fibre, and albumen, together with an acid called fungic acid. A large number of species are eaten on the continent of Europe, which are not used in this country at all. The species mostly found in the London markets are as follows:—

1. The common mushroom (*Agaricus campestris*), of which models are exhibited in the case. This fungus is salted and pressed, and the sauce known by the name of "catsup," or ketchup, is thus procured. It is also eaten broiled or stewed, or added to other articles of diet.
2. The morel (*Morchella esculenta*). It is a rare plant in Great Britain. The models in the case were taken from specimens furnished by F. Currey, Esq., and found in the neighbourhood of London. It is used to give a flavour to soups and gravies.
3. The truffle (*Tuber æstivum*). This fungus is solid and globular. It grows under ground, and dogs are trained to hunt for it. It gives a delicate flavour to gravies and sauces, and is used as a stuffing for animal food.

The champignon (*Marasmius oreades*), the chantarelle (*Cantharellus cibarius*), the orange agaric (*Lactarius deliciosus*), the eatable boletus (*Boletus edulis*), and several other species which are eaten in the countries of Europe, grow wild in Great Britain, but are not usually seen in the markets of this country.

It is a hazardous thing for persons to eat Fungi, unless they are well acquainted with the distinctions between those which are harmless and those which are injurious.

The following examples are exhibited in the case:—

Two specimens of a species of fungus (*Mylitta Australis*) called "native bread," from Tasmania. Dried edible fungi from Tahiti, fungi in spirit, truffles, morels, St. George's mushroom (*Agaricus gambosus*), dried mushrooms, wax models of the common mushroom, mushroom powder, preserved mushroom, and mushroom ketchup.

FUNGI. Frame containing twelve preparations of the spores or seeds of mushrooms.—Presented by Mr. Worthington G. Smith, F.L.S.

FUNGI. A series of 40 drawings, purposely enlarged, of British edible and poisonous Fungi. From actual specimens.—Purchased of the artist, Mr. Worthington G.

Smith, F.L.S., who prepared them expressly for the Food Museum.

FUNGI indigenous to Epping Forest and district (Case 104.) Group of specimens preserved by a new process. Given by Mr. James English, Epping.

FUNGI. (*See also* DIAGRAMS.)

GAZOGENE. (*See* WATER.)

GELATIN. (*See* FORCE-PRODUCERS).

GIN. (*See* DISTILLED SPIRITS.)

GLUTEN. (*See* FLESH-PRODUCERS IN FOOD.)

GOOSEBERRIES (Case 16). *Substances illustrating the chemical analysis of one pound of Gooseberries.*

Gooseberries vary much in their flavour and composition, according to the relative quantities of sugar and acid they contain. They yield only a small quantity of flesh-forming matter. The salts are principally composed of malate of lime. Their husks are indigestible.

100 parts of gooseberries contain :—

Water	81·1	or,	WATER	81·1
Albumen	0·9		FLESH AND FORCE PRODUCERS	0·9
Sugar	6·2		FORCE-PRODUCERS	17·7
Malic acid	2·4		MINERAL MATTER	0·3
Citric acid	0·3			
Dextrin	0·8			
Cellulose	8·0			
Mineral matter	0·3			

The ingredients contained in 1 lb. of gooseberries are shown as follows :—

a. 1 *lb. of preserved gooseberries.*

1. Water in 1 lb. of gooseberries—13 oz.
2. Albumen in 1 lb. of gooseberries—63 gr.
3. Sugar in 1 lb. of gooseberries—1 oz.
4. Malic acid in 1 lb. of gooseberries—168 gr.
5. Citric acid in 1 lb. of gooseberries—21 gr.
6. Dextrin in 1 lb. of gooseberries—56 gr.
7. Woody fibre in 1 lb. of gooseberries—1 oz. 108 gr.
8. Mineral matter in 1 lb. of gooseberries—21 gr.

GRAPES (Case 14). *Substances illustrating the chemical analysis of one pound of Grapes.*

The grape is the fruit of the *Vitis vinifera*, which is extensively cultivated throughout Europe. Wine is made from the fermented juice of the Grape.

The following is the analysis of 1 lb. of grapes :—

Solid Parts.

	oz.	gr.
Stalk and seeds	2	220
Husks	0	218

Analysis of Juice.

Water - - - - -	10	222
Albumen - - - - - -	0	158
Glucose, or grape sugar - -	1	316
Gum - - - - - -	0	79
Tartaric acid - - - - -	0	50
Mineral matter - - - - -	0	50
Total -	16	0

Grapes contain a large quantity of grape sugar, and a quantity of tartaric acid, which gives them their acidity. The nutritious matter is small in quantity.

GRAPES. (*See also* CURRANTS, VINES, VINIFERÆ, and PRESERVED FRUITS.)

GUM. (*See* SUGAR.)

HARES AND RABBITS (Case 70). A series of stuffed and mounted specimens of the varieties of hares and rabbits indigenous to Great Britain and Ireland, consisting of the common English hare, Irish, Scotch, or varying hare, hybrid between hare and rabbit, and common English rabbit.

HEIGHT AND WEIGHT. (*See also* DIAGRAMS.) There is a fixed relationship between the height and weight of healthy individuals. The late Dr. Hutchinson took the height and weight of 2,650 healthy men. The results of his observations are given in the diagram. From these we may deduce the law that healthy men ought to weigh an additional five pounds for every inch in height beyond 61 inches, at which height they ought to weigh 120 pounds. In these cases the weight includes the clothes worn, which should be calculated at $\frac{1}{17}$ the weight; so that a man weighing 170 pounds, would weigh only 160 pounds without his clothes. When persons weigh more or less than the above averages, it generally depends on the undue increase or diminution of the quantity of fat in the body.

HONEY (Case 18.) This well-known sweet substance is the result of the labours of the honey bee. Honey is composed of grape sugar and cane sugar, to which are added a yellow colouring matter, a little wax and gum, and, according to some writers, an acid, which is probably lactic acid, formed from the decomposition of grape sugar. Honey has various flavors, according to the flowers from which the bees obtain their supplies. Honey is sometimes poisoned by the bee obtaining it from poisonous flowers, as those from the monkshood,

the kalmia, the rhododendron, and the azalea. The army of Cyrus was poisoned by honey collected by bees from the *Rhododendron ponticum*. Honey was the principal source of saccharine food to the ancients. Honey ferments in the same way as sugar, and the fermented beverages known as mead, metheglin, and hydromel are thus made. Before the general use of wine and beer these beverages were ordinarily consumed in this country. Samples of honey from France, Réunion, Gaboon, and Russia are exhibited, as well as a bottle containing hydromel.

HONEY. Beehives of various construction, chiefly French, with a fumigator, and a protecting mask used in taking the honey or securing a swarm of bees.—Presented by the French Commissioners, International Exhibition of 1862.

HONEY. Improved Beehives, exhibited by the Apiarian Society, Muswell Hill, Middlesex; and Beehives of various construction, exhibited by G. Neighbour and Son, of High Holborn and Regent Street, London; H. Marriott, 80, Gracechurch Street, E.C.; and J. Ramsay, Berwick-upon-Tweed.

HOPS. Samples of hops grown in France, Styria, and Austria.

HOPS (Case 101). Model of an improved method of training hops.—Presented by the inventor, Herr F. W. Hofman, Counsellor for Husbandry, Vienna.

HORSERADISH ROOTS. (*See* CONDIMENTS, and ACONITE ROOTS.)

HORSE'S TONGUE (Case 62). Modelled in wax.—Exhibited for comparison with a bullock's tongue, also modelled in wax and shown with it.

HUMAN BODY (Case 1). *The contents of this case are intended to illustrate the composition of the Human Body.*

Not only does food supply the daily waste of the human body, but, as the body increases in size from birth to adult age, it is supplied with materials for this increase by the aid of food. In order, therefore, to understand the value of food from its composition, it is necessary to know the composition of the human body. Just as any other compound substance can be submitted to chemical analysis and the elements of which it consists ascertained, so can the composition of the human body be discovered. Such analyses of course become difficult in proportion to the complication of the body analysed, and only an approach

to the true quantities in which the elements exist can be expected. The results of such an analysis have been attempted, and the quantities of each element entering into the composition of a human body weighing 11 stone, or 154 pounds, are (as far as possible) presented to the eye.

The following are the elements and their quantities :—

Ultimate Elements of the Human Body.

	lbs.	oz.	gr.
1. *Oxygen*, a gas. The quantity contained in the body would occupy a space equal to about 1,314 cubic feet -	111	0	0
2. *Carbon*, a solid. When obtained from animals it is called animal charcoal - - - - -	21	0	0
3. *Hydrogen*, a gas. The lightest body in nature. The quantity present would occupy about 2,622 cubic feet - - - - - - - -	14	0	0
4. *Nitrogen*, a gas. It would occupy, when free, about 20 cubic feet - - - - - -	3	9	0
5. *Calcium*, a solid. The metallic base of lime which has not yet been obtained in sufficient quantity to be employed in the arts. It is about the density of aluminium - - - - - - - -	2	0	0
6. *Phosphorus*, a solid. This substance is so inflammable that it can only be kept in water - -	1	12	190
7. *Chlorine*, a gas. When combined with sodium it forms common salt - - - - - -	0	2	382
8. *Sulphur*, a solid. A well-known substance. It unites with hydrogen, forming sulphuretted hydrogen, which gives the unpleasant smell to decomposing animal and vegetable matter - - - -	0	2	219
9. *Sodium*, a metal. It is so light that it floats on water, and is kept in naptha to prevent its oxidation -	0	2	116
10. *Fluorine*, a gas. This substance has not been separated in such a manner as to permit of an examination of its properties, and cannot be exhibited. It is found united with calcium in the bones - -	0	2	0
11. *Potassium*, a metal. Like sodium it floats on water, and burns with a flame when placed on it -	0	0	290
12. *Iron*, a metal; in small quantities it is necessary to the health of the body - - - - -	0	0	100
13. *Magnesium*, a metal. Combined with oxygen it forms magnesia - - - - - -	0	0	12
14. *Silicon*, a non-metallic substance. With oxygen it forms silex or silica. It enters into the composition of the teeth and hair - - - - - -	0	0	2
Total	154	0	0

Other elements have been found in the body, as copper and manganese, but these are probably accidental.

These elements, when combined together, form a set of compound bodies called "proximate principles," out of which the tissues and fluids of the body are formed.

Proximate Principles of the Human Body.

	lbs.	oz.	gr.
1. *Water*, composed of oxygen and hydrogen gases	111	0	0
2. *Gelatin*, of which the walls of the cells and many tissues of the body, as the skin and bones, are principally composed - - - - - -	15	0	0
3. *Fat*, which constitutes the adipose tissue -	12	0	0
4. *Phosphate of Lime*, forming the principal part of the earthy matter of the bones - - -	5	13	0
5. *Fibrin*, forming the muscles and the clot and globules of the blood - - - - - -	4	4	0
6. *Albumen*, found in the blood and nerves - -	4	3	0
7. *Carbonate of Lime*, also entering into the composition of bone - - - - - -	1	0	0
8. *Chloride of Sodium*, common salt - -	0	3	376
9. *Fluoride of Calcium*, found in the bones - -	0	3	0
10. *Sulphate of Soda* - - - - -	0	1	170
11. *Carbonate of Soda* - - - -	0	1	72
12. *Phosphate of Soda* - - - -	0	0	400
13. *Sulphate of Potash* - - - -	0	0	400
14. *Peroxide of Iron* - - - - -	0	0	150
15. *Phosphate of Potash* - - - -	0	0	100
16. *Phosphate of Magnesia* - - - -	0	0	75
17. *Chloride of Potassium* - - - -	0	0	10
18. *Silica* - - - - - -	0	0	3
Total	154	0	0

These compounds in passing away from the body form many others, which may be here left out of consideration as not forming a necessary part of the fabric of the human body.

Human Body (Case 3). A collection of some of the compound substances found in the human body.

Human Body (Case 2). *Daily supply and waste of the Human Body.* The contents of the case illustrate the quantity of substances taken in and given out in 24 hours by a person measuring 5 feet 8 inches, and weighing 154 lbs. The quantity of food taken by various individuals differs according to age, height, occupation, climate, season, and state of health. Children take more in proportion to their size than adults, as their food supplies the materials of growth as well as waste. The height of individuals determines their weight, and according to the quantity of flesh will be the waste and the necessity for supply. Persons employed in occupations in which great muscular exertion is necessary, require more food than those engaged in quiet or sedentary employments.

HYDROCYANIC ACID. (*See* FLAVORERS).

ICELAND MOSS (Case 7). (*See* also STARCH). *Substances illustrating the chemical analysis of one pound of Iceland Moss.*

The substance sold under this name is a lichen. It is found abundantly in the northern parts of the world. It contains but little flesh-forming matter, and a considerable quantity of the form of starch called *Lichenin.* Although employed as a remedy in disease, its medicinal properties are very doubtful. It should only be used in diet for the same purposes as starch.

100 parts of Iceland moss contain :—

Gluten	1·0	or,	FLESH AND FORCE PRODUCERS	1·0
Lichen starch and cetrarin	47·0		FORCE-PRODUCERS	60·0
Sugar	3·0		COMBUSTIBLE MATTER of uncertain use	37·0
Gum and extractive	10·0		MINERAL MATTER	2·0
Woody fibre	36·0			
Coloring matter	1·0			
Ashes	2·0			

The constituents of 1 lb. of Iceland moss are shown as follows :—

a. 1 *lb. of Iceland moss.*
1. Lichenin in 1 lb. of Iceland moss—7 oz. 220 gr.
2. Sugar in 1 lb. of Iceland moss—210 gr.
3. Gluten in 1 lb. of Iceland moss—70 gr.
4. Woody fibre in 1 lb. of Iceland moss— 5oz. 330 gr.
5. Gum and extractive in 1 lb. of Iceland moss—1 oz. 263 gr.
6. Coloring matter in 1 lb. of Iceland moss—78 gr.
7. Mineral matter in 1 lb. of Iceland moss—140 gr.

Various other edible mosses are shown in the case.

INDIAN CORN. (*See* MAIZE.)

INDIAN FOOD PRODUCTS (Cases 82, 83, and 84). A collection of samples of food products from India, consisting of grains, pulses, condiments, spices, narcotics, oils, coffee, sugar, fungi, salep, arrowroot, &c. &c.—Presented by Dr. Forbes Watson. Also a series of samples of pulses, cereals, oil seeds, narcotics, condiments, &c., from the Mysore District, Southern India.—Presented by Major Puckle, Mysore.

INSECTS USED AS FOOD. (*See* descriptive label suspended from rail.)

INULINE. (*See* STARCH.)

ISINGLASS (Cases 90 and 91). Is most prized when obtained from the sound or swimming bladder of the sturgeon (*Acipenser Sturio*). It is chiefly imported from Russia. Varieties of this substance, illustrating its quality, manufacture, and even application to ornamental purposes,

are exhibited.—Presented by James Vickers, Esq., Isinglass Merchant and Manufacturer, 23, Little Britain, London, E.C.; and the Commissioners for the Great Exhibition of 1851.

IVORY DUST and SHAVINGS (Case 71). Sometimes used for making jellies.

JAPANESE FOOD (Case 81). Various samples of food products from Japan, such as rice, wheat, and other grains, edible sea-weeds, condiments, gelatine or gelose, dried and salted fish, sea-slugs, fungi, confectionery, and other specimens, the nature of which is not known.

JELLIES (Case 71). Samples of jelly made from calves feet, and flavoured with various fruits.—Presented by A. Houliston, 8, Park Terrace, Regents Park.

JERUSALEM ARTICHOKE (Case 12). *Substances illustrating the chemical analysis of one pound of Jerusalem Artichokes.*

The Jerusalem artichoke of the English, the *Topinambour*, and *Pois de terre* of the French, is a native of the Brazils, and was introduced into Europe in the year 1617. It resembles the potato in its general composition, but contains a larger quantity of sugar and less starch. It also contains more water and less flesh-forming matter than the potato.

In 100 parts there are :—

Water	76·35	or,	WATER	76·35
Albumen	0·90		FLESH AND FORCE PRODUCERS	0·90
Starch (Inulin)	3·00		FORCE-PRODUCERS	21·14
Gum (Dextrin)	1·22		MINERAL MATTER	1·61
Fat	·90			
Sugar	14·80			
Woody fibre	1·22			
Mineral matter	1·61			

The ingredients in 1 lb. of Jerusalem artichokes are shown as follows :—

a. 1 *lb. of Jerusalem artichokes.*
b. 1 *lb. of Jerusalem artichokes dried.*
1. Water in 1 lb. of Jerusalem artichokes—11 oz. 264 gr.
2. Sugar in 1 lb. of Jerusalem artichokes—2 oz. 260 gr.
3. Starch in 1 lb. of Jerusalem artichokes—260 gr.
4. Gum in 1 lb. of Jerusalem artichokes—113 gr.
5. Fat in 1 lb. of Jerusalem artichokes—86 gr.
6. Woody fibre in 1 lb. of Jerusalem artichokes—113 gr.
7. Albumen in 1 lb. of Jerusalem artichokes—86 gr.
8. Mineral matter in 1 lb. of Jerusalem artichokes—129 gr.

LACUSTRINE habitations of Swiss Lakes. (*See* SWITZERLAND.)

LAMB. (*See* FLESH USED AS FOOD.)

LEGUMIN. (*See* FLESH-PRODUCERS IN FOOD.)

LENTILS (Case 30). *Substances illustrating the chemical analysis of one pound of Lentils.*

Lentils are particularly nutritious, and are extensively used as food in various parts of the world. The food sold under the name of "Revalenta Arabica" is the meal of the lentil after being freed from its outer skin, which is indigestible. The "red pottage" for which Esau sold his birthright, appears to have been made of the variety having red coloured seed.

100 parts contain, as far as is known :—

Water	14·0
Casein	26·0
Starch	35·0
Sugar	2·0
Gum	7·0
Fat	2·0
Woody fibre	12·5
Mineral matter	1·5

or,

WATER	14·0
FLESH AND FORCE PRODUCERS	26·6
FORCE-PRODUCERS	58·5
MINERAL MATTER	1·5

The ingredients in 1 lb. of lentils are shown as follows :—

a. 1 *lb. of lentils.*
1. Water in 1 lb. of lentils—2 oz. 105 gr.
2. Casein in 1 lb. of lentils—4 oz. 70 gr.
3. Starch in 1 lb. of lentils—5 oz. 262 gr.
4. Sugar in 1 lb. of lentils—140 gr.
5. Gum in 1 lb. of lentils—1 oz. 153 gr.
6. Fat in 1 lb. of lentils—140 gr.
7. Woody fibre in 1 lb. of lentils—2 oz.
8. Mineral matter in 1 lb. of lentils—105 gr.

A variety of samples of lentils from Algeria, Egypt, France, Portugal, Réunion, Spain, Tripoli, and Turkey, are shown in the case.

LIQUEURS. (*See* DISTILLED SPIRITS.)

LIQUORICE. (*See* SUGAR.)

LOBSTERS. (*See* CRUSTACEOUS ANIMALS.)

LOCUST BEANS. (*See* CAROB BEANS.)

LOGWOOD CHIPS. (*See* ADULTERATION OF FOOD.)

LOZENGES (Case 90). (*See* SUGAR CONFECTIONS.)

LUPINS (Case 52). Samples of lupin seeds from Egypt, Portugal, Spain. (*See also* COFFEE SUBSTITUTES.)

MACCARONI AND OTHER PASTES (Case 105). Samples of maccaroni, vermicelli, and other Italian pastes made from the flour of hard wheat grown in Algeria.—Presented by the French Commissioners, International Exhibition of 1862.

MACCARONI, VERMICELLI, SEMOLINA, &c. (Case 105), prepared from wheaten flour, from Portugal, Italy, France, &c.

MAIZE OR INDIAN CORN (Case 28). *Substances illustrating the chemical analysis of one pound of Maize.*

What wheat is in Europe, rice in Asia, maize is in America. It belongs to the natural order of grasses (*Graminaceæ*), and is remarkable in this group for the large size of its grains, and the heads into which they are collected. The stem of the maize grows from five to seven feet in height. The stamens are placed in terminal flowers at the top of the stalk, whilst the fruit-bearing flowers are placed on the side of the stalk.

The maize is a native of the New World, and grows wild in the neighbourhood of Mexico and the Rocky Mountains. It was not known in other parts of the world till after the discovery of America. It has now been introduced into every quarter of the globe. It is cultivated extensively in the south of Europe, on the African coasts of the Mediterranean, in Turkey, Egypt, Hindostan, China, the islands of the Eastern Archipelago, and in the West Indies.

Several varieties are cultivated, which differ in the size, form, and colour of their grains.

Although maize will grow in the British Islands, it cannot be relied on as a field crop.

Maize was not much consumed in Great Britain till the year of the potato famine, 1846, when considerable quantities of the grain and meal of the maize called "Hominy" were imported. There is now a regular demand, and about 2,000,000 of quarters are imported. Of this the larger quantity comes from the ports of the Black Sea and the Mediterranean.

Maize is an excellent food for man and beast. The meal will not form bread alone, but it may be made into porridge, puddings, cakes, and other forms of diet. Maize contains less nutritive matter than wheat, but it contains more fat. It is largely used in this country on account of its starch, which is separated and used as an article of diet in place of arrow-root and the amylaceous foods.

Maize yields a large return of food on a given extent of land. It contains less nutritive matter than other cereals, but is rich in starch and fat, and consequently has remarkable fattening qualities.

100 parts contain :—

Water	14·0	or,	WATER - 14·0
Gluten	12·0		FLESH AND FORCE PRODUCERS - 12·0
Starch	60·0		FORCE-PRODUCERS - 73·0
Sugar, Gum	0·3		MINERAL MATTER - 1·0
Fat	7·7		
Woody fibre	5·0		
Mineral matter	1·0		

The ingredients in 1 lb. of maize or Indian corn are shown as follows :—

a. 1 *lb. of maize or Indian corn.*
b. 1 *lb. of maize meal.*
1. Water in 1 lb. of Indian meal—2 oz. 105 gr.
2. Gluten in 1 lb. of Indian meal—1 oz. 402 gr.
3. Starch in 1 lb. of Indian meal—9 oz. 262 gr.
4. Sugar and gum in 1 lb. of Indian meal—21 gr.
5. Fat in 1 lb. of Indian meal—1 oz. 101 gr.
6. Woody fibre in 1 lb. of Indian meal—350 gr.
7. Mineral matter in 1 lb. of Indian meal—70 gr.

Specimens of maize grown in the neighbourhood of London are exhibited in the Museum, as well as an extensive series of varieties from the following countries :—British Guiana, Egypt, France, Greece, New South Wales, Peru, Portugal, Queensland, Russia, Senegal, Spain, United States of America, and Venezuela. Many of the specimens were presented by Messrs. Peter Lawson and Son of Edinburgh. Various preparations from maize are also shown in the case containing the analysis.

MAIZE (Case 118). Preparation from the flour or farina of maize called "Maizena," with samples of biscuits, &c.—Presented by Messrs. Tomlin, Rendell, and Co., 33, Eastcheap, London, E.C.

MAIZE (Case 118). A preparation of Indian corn called "Hominy."—From Pennsylvania, U.S.

MAMMALS. (*See* FLESH USED AS FOOD.)

MANNA. (*See* SUGAR.)

MATÉ. (*See* PARAGUAY TEA.)

MEASLED PORK. (*See* DISEASED MEAT.)

MILK (Case 55). *Substances illustrating the chemical analysis of one pound of Milk.*

Of all animal foods milk is the most important, as it may be regarded as the type of human food. It is one of the most important articles of diet. The young of all the mammalia are fed entirely upon it during the first period of their life. It varies in composition in different animals.

In the cow it consists in 100 parts :—

Water	86·0	or,	Water - 86·0
Casein	5·0		Flesh and Force Producers - 5·0
Butter	3.5		Force-producers 8·0
Sugar of Milk	4·5		Mineral matter 1·0
Mineral matter	1·0		

One pound (about one pint) of cow's milk, when digested and oxidized in the body, is capable of producing a force equal to 390 tons raised one foot high. The maximum of work which it will enable a man to perform is 78 tons raised one foot high. One pound of cow's milk can produce at the maximum $\frac{8}{10}$ oz. of dry muscle or flesh.

The composition of human milk and asses' milk, as contrasted with cows' milk, may be seen as under :—

	Cows' Milk.	Human Milk.	Asses' Milk.
Water in 100 parts - -	86	$89\frac{1}{2}$	90
Flesh and force producers, Casein - - -	5	3	2
Force-producers: Butter - -	$3\frac{1}{2}$	3	$1\frac{1}{2}$
Force-producers: Sugar of Milk	$4\frac{1}{2}$	4	6
Mineral matter - -	1	$\frac{1}{2}$	$\frac{1}{2}$
	100	100	100

The composition of one pound of cows' milk, one pound of human milk, and one pound of asses' milk, may be seen in the case.

The milk of the cow is extensively employed as an article of diet in Europe. In Sweden and Denmark sheep's milk is used ; in Switzerland, goats' milk ; in Lapland, reindeers' milk ; and in Tartary, mares' milk. In England the milk of the ass, on account of its resemblance to human milk, is frequently employed for young children as food. When milk is allowed to stand, oily globules invested with thin membranes rise to the surface in the form of "cream." Butter is formed from cream by the process of "churning," in which process the membrane of the globules is broken up and the fatty contents become aggregated into a mass. The casein is held in solution in the milk by the aid of certain salts ; when these are removed by acids the casein coagulates, and forms "curds." When the curd is removed with or without the butter, and pressed, it forms cheese. The best and highest-priced cheeses are those in which there is most butter. The casein without the butter is hard and indigestible.

Milk (Case 54). Series illustrating the adulteration of milk with water, consisting of graduated tubes showing

the amount of cream obtained from different samples of milk; also the application of the "gravity lactometer," or milk measurer as a means of detecting the adulteration of milk with water. The milk used for these illustrations is renewed every week.

MILK (Case 55). A group of crystals of sugar of milk, deposited from a quart of milk.—Presented by Dr. Lankester.

MILLET (Case 13.) (*See also* SUGAR MILLET.) *Substances illustrating the chemical analysis of one pound of Millet.*

Millets are different species of *Sorghum, Setaria, Panicum*, and other grasses. Their composition varies within certain limits to a considerable extent. They contain from five to 10 per cent. of flesh-forming matter, from 70 to 80 per cent. of starch, and from two to four per cent. of fatty matter. The following is the analysis of a specimen without the husk. It is the produce of *Panicum spicatum*, and is known in the East Indies by the name of Tipsee Gooruroo.

100 parts contain :—

Water - -	11·7
Albumenoid matters	8·6
Fat - -	4·1
Starch - -	70·0
Woody fibre -	4·3
Mineral matter -	1·3

or,

WATER - -	11·7
FLESH AND FORCE PRODUCERS -	8·6
FORCE-PRODUCERS	78·4
MINERAL MATTER	1·3

The ingredients of one pound of millet are shown as follows :—

a. 1 *lb. of Indian millet.*
b, c, and d. *Varieties of millet.*
1. Water in 1 lb. of millet—1 oz. 382 gr.
2. Albumenoid matters in 1 lb. of millet—1 oz. 165 gr.
3. Fat in 1 lb. of millet—287 gr.
4. Starch in 1 lb. of millet—11 oz. 89 gr.
5. Woody fibre in 1 lb. of millet—301 gr.
6. Mineral matter in 1 lb. of millet—90 gr.

Samples of various sorts of millet from Canada, Germany, Portugal, Spain, India, Egypt, Senegal, Tripoli, Bohemia, Russia, and Persia are shown in Case 118.

MILLET (Case 13). Sample of millet from the Hakkery country, Mosul, Persia.—Presented by C. A. Rassam, Esq., British Consul at Mosul.

MINERALS IN FOOD (Case 4).

This case shows the principal mineral substances, excepting water, in food. They are generally essential to proper nutrition. In the body of a man, weighing 154 lbs., there are about 8 lbs. of mineral matter. Different parts of the

body show peculiar affection for particular ingredients to the exclusion of others.

1. *Phosphate of Lime,* or bone earth, consists of phosphorus, calcium, and oxygen. There is no animal tissue in the body in which it is not present. In bone it forms from 48 to 59 parts in 100; the bones most exposed to mechanical influences containing the largest quantity. It is always found with flesh-forming substances, whether derived from the vegetable or animal kingdoms; generally in the proportion of 0·5 to two per cent. Casein contains six per cent.

2. *Carbonate of Lime,* or chalk, always occurs in the bones, though in much less quantity than bone earth, the proportions being one to four parts in a newly-born child, one to six parts in an adult, and one to eight parts in the old. It is also found in animal concretions.

3. *Phosphate of Magnesia.* This substance is present in only small quantities, in the bones and in animal fluids.

4. *Fluoride of Calcium,* or fluor spar, exists in small quantities in animal tissues, but more abundantly in the bones and teeth.

5. *Silica,* or flint, exists in small quantities in the enamel of the teeth and hair.

6. *Chloride of Sodium,* or common salt, forms the greatest part of the soluble mineral ingredients in all animal tissues. In blood, six parts in 1,000 consist of salt. It no doubt exerts an influence on the change of tissues, on the action of the gastric juice, and on other functions.

7. *Carbonate of Soda* is found in small quantities in blood, and is useful in dissolving fibrin, casein, and other flesh-formers; it may also aid in respiration.

8. *Phosphates of Soda and Potash.* Salts of soda and potash certainly exist both in blood and the tissues, and they may be present as phosphates, but our knowledge on this subject is deficient.

9. *Iron* is found in blood, gastric juice, hair, black colouring matter of the eye, &c.

10. *Sulphates of Soda and Potash* exist occasionally in animal fluids, but do not appear to be essential.

11. *Carbonate of Magnesia* occurs very sparingly in the body, and is not deemed essential.

12. *Oxide of Manganese* is found in bile, gall-stones, &c., but would appear to be only accidentally present.

13. *Copper and Lead* are rarely found in the blood, but generally in the bile, of man. They are, no doubt, deleterious, and introduced accidentally.

14. *Sulphocyanide of Sodium,* though not existing in food, is found generally in the saliva of man.

15. *Chloride of potassium.* In small quantities.

MISCELLANEOUS. A series of fruits grown in the Botanical Gardens at Brisbane, Queensland, Australia, consisting of oranges, lemons, jujubes, bananas, mulberries, pine-apples, Cape gooseberries, passion flower fruit, loquats, jack fruit, and tamarinds.—Presented by the Royal Horticultural Society, South Kensington, London, W.

MISCELLANEOUS. Patent air-tight jars for jams, preserves, &c.—Exhibited by Doulton and Watts, Lambeth Pottery, London, S.

MODELS in terra-cotta of various tropical fruits (Case 89). Presented by Dr. Shortt.

MODELS in wax of various vegetables (Case 89).—Presented by Messrs. Peter Lawson and Son, Edinburgh.

MODELS of various kinds of Fruit grown in the Australian Colony of New South Wales (Case 45).

MOLLUSCOUS ANIMALS USED AS FOOD (Case 60).

These creatures, comprise what are commonly called "shell-fish" (apart from the crustacea which sometimes go by that name) and afford a large number of edible forms. They may be divided for dietetical purposes into two groups,—those with one shell, and those with two shells—univalves and bivalves. Amongst the latter the most important is the oyster. In the case is an interesting series illustrating the growth of the oyster; from which it will be seen that the young oyster is at first a locomotive being, and only subsequently comes to rest, and gradually grows, and is not fit to eat until it is five or six years old. Shells of the different varieties of oysters brought to the London markets are also exhibited. The mussel, the pecten or scallop, and the cockle, are also shown.

In the case is a series of univalve mollusks, which include the whelk, and the periwinkle from the sea, and the common snail, and the Roman snail (*Helix Pomatia*) from the land. The latter is abundant on some of the chalk downs of this country, and is at the present moment a favourite article of diet in France and other parts of the Continent.

MOSSES. (*See* ICELAND MOSS.)

MUSHROOMS. (*See* FUNGI.)

MUSCATELS. (*See* VINIFERÆ, OR FRUITS OF THE VINE.)

MUTTON. (*See* FLESH USED AS FOOD.)

NARCOTICS (Case 92). (*See also* DIAGRAMS, OPIUM, and TOBACCO.)

There is a class of substances which are remarkable for their action on the nervous system, and which are called narcotics. A large number of them are used in medicine, and not a few have been employed by man as articles of diet. Some of them act as restoratives of the nervous power, whilst others are more remarkable for their sedative action. We may include under this head the alkaloid caffeine contained in tea and coffee, and the active principles of tobacco, hemp, and opium.

A series of the active principles obtained from Opium, presented by the Society of Apothecaries, Apothecaries Hall, and examples of various vegetable substances, more or less narcotic, are exhibited in the case. Among them are the following:—stramonium or thorn apple, seeds of nux vomica, "Coca" leaves, coculus indicus, hemlock leaves, betel nuts, long pepper, common hemp, cigars made of stramonium, belladonna, and henbane, common camphor, Borneo camphor, &c. &c.

The fruits of narcotic plants are often consumed by mistake in this country, and produce fatal effects. Specimens of the deadly nightshade, woody nightshade, and garden nightshade, preserved in Goadby's solution, will be found in the Collection. The berries of all these plants are poisonous. The common henbane is another powerfully narcotic British plant.

There is another British plant containing a poisonous narcotic principle, the root of which has been occasionally mistaken for horseradish, with fatal effects. This is the aconite or wolf's bane (*Aconitum Napellus*). The roots of these two plants are exhibited in the Collection for the purpose of indicating their difference.

NATIONAL FOOD. (*See* CHINESE FOOD; INDIAN FOOD PRODUCTS; JAPANESE FOOD; SIAMESE FOOD.)

Various products of foreign nations are exhibited in the Collection, particularly an extensive series of preparations of food from China. As this collection has a unity and completeness of its own, it was thought desirable not to separate it. It is hoped that other collections of the same kind, and illustrating national peculiarities of diet, may be formed, and presented to the Food Collection.

NECTARINES. (*See* PEACHES AND NECTARINES.)

NEW ZEALAND PRESERVE. (*See* PRESERVED FRUIT.)

NUTS, ETC. (*See also* OLEAGINOUS FOOD.) Various samples of hazel nuts, chesnuts, walnuts, almonds, &c. Presented by Mr. J. W. Draper, of Covent Garden Market.

OATS (Case 29). (*See also* CEREALS.) *Substances illustrating the chemical analysis of one pound of Oats.*

The oat is largely consumed in this country as food. It is a much hardier plant than either wheat or barley, and ripens its fruit in higher northern latitudes. An insular climate is adapted to its growth, hence it has been extensively cultivated in the British islands, more particularly Scotland, where the best oats are grown.

The oat, like other cereal grains, is well adapted for human food, as it contains the mineral, flesh-forming, and heat-giving constituents which are essential to food. Oatmeal is not so digestible as wheaten flour or wheaten meal, hence persons whose occupations are sedentary prefer the latter; but for those who work or take exercise in the open air, oatmeal is a more economical and strengthening diet than wheaten flour. Oatmeal cannot be made into bread, and is usually eaten in the form of a cake or oatmeal porridge. The latter is usually eaten with milk, and is then a very nourishing and healthful article of diet.

Nearly twice as much oats as wheat is raised in the United Kingdom, but comparatively small quantities are imported. Their large consumption depends on their being used as the principal food of horses.

Oats, in the form of oatmeal, are rich in flesh and force-producers, and serve as a nutritious and excellent diet, when the occupation is not sedentary. The outer husk of oats, unlike wheat, is poor in albumenoid matters, so that oatmeal is better than the whole oat as food. In making oatmeal, one quarter of oats (328 lbs.) yields 188 lbs. of meal and 74 lbs. of husks, the rest being water. Oatmeal is remarkable for its large amount of fat.

100 parts contain:—

Water	13·6	or,	WATER	13·6
Albumenoid matters	17·0		FLESH AND FORCE PRODUCERS	17·0
Starch	39·7		FORCE-PRODUCERS	66·4
Sugar	5·4		MINERAL MATTER	3·0
Gum	3·0			
Fat	5·7			
Woody fibre	12·6			
Mineral matter	3·0			

The constituents of 1 lb. of oatmeal are thus exhibited:—

a. 1 *lb. of oats with the usual husk.*
b. 1 *lb. of oatmeal, of which about 57 per cent. is obtained from oats.*
1. Water in 1 lb of oatmeal—2 oz. 78 gr.
2. Albumenoid matters in 1 lb. of oatmeal—2 oz. 316 gr.
3. Starch in 1 lb. of oatmeal—6 oz. 153 gr.

4. Sugar in 1 lb. of oatmeal—378 gr.
5. Gum in 1 lb. of oatmeal—210 gr.
6. Fat in 1 lb. of oatmeal—397 gr.
7. Woody fibre in 1 lb. of oatmeal—2 oz. 6 gr.
8. Mineral matter in 1 lb. of oatmeal—210 gr.
9. *Carbon in 1 lb. of oatmeal—6 oz. 348 gr.*

Various products from oats are also shown in the case.

One pound of oatmeal, when digested and oxidized in the body, is capable of producing a force equal to 2,439 tons raised one foot high. The maximum of work which it will enable a man to perform is 488 tons raised one foot high. One pound of oatmeal can produce at the maximum 2¾ oz. of dry muscle or flesh.

ODIKA BREAD FROM AFRICA. (*See* DIKA BREAD.)

OILS AND OLEAGINOUS FOOD (Case 22).

Under the names of oil, butter, fat, lard, suet, grease, a substance is used largely as an article of food which differs chemically from starch and sugar in the small quantities of oxygen gas it contains. The composition of these oleaginous substances may be represented generally as follows:—Carbon, 11 parts; hydrogen, 10 parts; oxygen, 1 part.

Oils vary in their chemical composition and physical properties. Many vegetable oils, as cocoa-nut oil and olive oil, contain two principles, one of which is liquid, and remains so at all ordinary temperatures; the other is solid when the temperature falls below 40 degrees. The former is called *olein,* and the latter *stearin.* Fats, lards, and butters are composed of the latter, or of principles having the same property.

Olein, stearin, and other fatty principles consist of acids combined with a base. This base is called *glycerin,* and is separated from oils in the process of soap-making.

The principal source of oil used as food from the vegetable kingdom is the olive (*Olea Europea*). The seeds of most plants contain oil in addition to starch and other matters. The seeds of the palm tribe contain much oil, as the coco nut palm (*Cocos nucifera*). So also do the seeds of the cocoa or chocolate plant (*Theobroma Caçao*).

The following table gives the quantities of oil or fat in 100 lbs. of the more common articles of food :—

Vegetable Food.

Cocoa	50·0	Lentils	2·0
Coffee	12·0	Wheat flour	1·2
Indian meal	7·7	Rye	1·0
Oatmeal	5·7	Buckwheat	1·0
Tea	4·0	Rice	0·7
Peas	2·0	Barley meal	0·3
Beans	2·0	Potatoes	0·2

Animal Food.

Pork	- - 50·0	Veal	- - - 16·0
Mutton	- 40·0	Fish	- - - 7·0
Beef	- - 30·0	Milk	- - - 3·5
Cheese	- - - 25·0		

A series of edible oils from various countries and sources is exhibited in the case. The seeds of most plants contain oil in addition to starch and other principles. Many seeds are used for obtaining oil for various purposes in the arts, as the poppy, rape, mustard, hemp, and flax seeds. Examples of various kinds of nuts or seeds eaten as food are exhibited (Case 20), such as almonds, chesnuts, walnuts, hazel nuts, Brazil nuts, pekan nuts, hickory nuts, pistachio nuts, beech nuts, cashew nuts, pine seeds, sapucaya nuts, souari or butter nuts, &c., &c.

OILS. Black and white Sesamum seed, with samples of the oil obtained from each. From Formosa.—Presented by R. Swinhoe, Esq.

OILS. Oil of the "Dugong" (*Halicore Australis*), from Brisbane, Australia.—Presented by Mr. R. Kennedy.

OIL OF BITTER ALMONDS. (*See* FLAVORERS.)

OLEAGINOUS FOOD. (*See* OILS.)

OPIUM (Case 92). (*See also* NARCOTICS.)

Opium is the juice of the poppy (*Papaver somniferum*). It is obtained from the cultivated plant by piercing the capsules and collecting the juice as it exudes. It is then dried and formed into small masses, and covered with leaves of various kinds, or other thin substances, as mica, &c.

The poppy is cultivated extensively for this purpose in Turkey, Egypt, and the East Indies. It has also been introduced into Europe, but the opium is not so powerful.

Opium is indebted for its active properties to a principle called *morphia* or *morphine*. Besides morphia, it contains other active principles, which are also narcotic. These have been presented to the Collection by the Society of Apothecaries, Apothecaries Hall.

These active principles are combined with caoutchouc, gum, and other vegetable matters in the opium of commerce.

Opium is used extensively as a medicine, on account of its power of alleviating pain and inducing sleep. In small doses it acts as a stimulant. On account of this latter property, and its subsequent soothing influence, it has been indulged in by man, and is consumed largely in China and other parts of the world as a dietetical luxury. When

taken for this purpose it is smoked, and is generally consumed with tobacco or some other leaf in a pipe. Pipes used for this purpose in China are exhibited in one of the cases containing Chinese food, with a collection of Chinese tobaccos, most of which appear to contain opium.

ORANGES, &c. (Case 109). The natural order *Aurantiaceæ* embraces the orange, lemon, citron, shaddock, pommeloe, lime, and other fruits. All of them contain citric acid and varying proportions of sugar. The flowers of the orange yield a delicious perfume known as oil of Neroli, and they are also candied and eaten as a sweetmeat. Various specimens of the edible products of the orange tribe are shown in the case. The juice of these fruits is employed in the navy for the purpose of preventing scurvy. This effect has been attributed solely to the citric acid, but it has been found that the acid alone does not act so efficaciously as when contained in the juice of the fruit.

OX-BONES. (*See* BONES USED AS FOOD.)

OXEN. (*See* BREEDS.)

OYSTERS. (*See* MOLLUSCOUS ANIMALS.)

PARAGUAY TEA, OR MATÉ (Case 49).

The Maté occupies the same important position in the domestic economy of South America as the Chinese tea (*Thea Sinensis*) does in this country. The leaves of the maté plant, a species of holly (*Ilex Paraguayensis*), are from four to five inches in length, and are prepared by drying and roasting, not in the manner of the Chinese teas, in which each leaf is gathered separately, but large branches are cut off the plants and placed on hurdles over a wood fire until sufficiently roasted ; the branches are then placed on a hard floor and beaten with sticks ; the dried leaves are thus knocked off and reduced to a powder, which is collected made into packages, and is ready for use. There are three sorts known in the South American markets ; the caa-cuys, which is the head of the leaf ; the caa-miri, the leaf torn from its midrib and veins, without roasting ; and the caa-guaza or yerva de palos of the Spaniards, the whole leaf, with the petioles and small branches roasted. The method of preparing it for drinking is by putting a small quantity, about a teaspoonful, into a gourd or cup, with a little sugar ; the drinking tube is then inserted, and boiling water poured on the maté. When sufficiently cool to drink without scalding the mouth, the infusion is sucked up through the

tube. It has an agreeable slightly-aromatic odour, is rather bitter to the taste, and very refreshing and restorative to the human frame after enduring great fatigue. It contains the same active principle as tea and coffee, called caffeine; but does not possess the volatile and empyreumatic oils of those substances. It is calculated that about 40,000,000 lbs. of this substance are consumed annually in South America.

In the case are specimens of Paraguay tea, with native calabash for making the infusion, and sucker for drinking it.—Presented by W. Wanklyn, Esq.

PARSNIPS (Case 11). *Substances illustrating the chemical analysis of* 1 *lb. of Parsnips.*

The parsnip has been long used in Europe as an article of diet. On account of the woody fibre it contains it is less digestible than potatoes. It contains also less sugar, starch, and nutritive matter; hence, on the introduction of the potato into the Old World, it became very much less consumed. It has a peculiar flavour, which is much liked by some people, and it still continues to be used as an article of diet, especially with boiled salt fish and beef.

The common parsnip is a cultivated variety of the wild parsnip (*Pastinaca sativa*). It contains less water and more nutritive matter, more woody fibre and less sugar, than either turnips or carrots. 100 parts of parsnips contain:—

Water - - -	82·039
Albumen and casein	1·215
Sugar - - -	2·882
Starch - - -	3·507
Fat - - -	0·546
Gum - - -	0·748
Woody fibre -	8·022
Mineral matter -	1·041

or,

WATER - -	82·0
FLESH AND FORCE PRODUCERS -	1·2
FORCE-PRODUCERS	15·8
MINERAL MATTER	1·0

The ingredients in 1 lb. of parsnips are shown as follows:—

a. 1 *lb. of parsnips.*
b. 1 *lb. of dried parsnips.*
1. Water—13 oz. 53 gr.
2. Albumen and casein—87 gr.
3. Sugar—210 gr.
4. Starch—245 gr.
5. Fat—35 gr.
6. Gum—52 gr.
7. Woody fibre—1 oz. 123 gr.
8. Mineral matter—70 gr.

PEACHES AND NECTARINES (Case 16). *Substances illustrating the chemical analysis of* 1 *lb. of Peaches.*

The peach and nectarine are both the produce of the same species of plant. The peach is downy, the nectarine is smooth. They contain a considerable quantity of sugar, but only a small proportion of nutritive matter. The skin

of these fruits is composed chiefly of woody fibre, and is indigestible. The seeds contain oil of bitter almonds, and are used in flavouring brandy and making noyeau.

100 parts of peaches contain :—

Water - -	73·7	or,	WATER - 73·7
Albumen - -	0·2		FLESH AND FORCE PRODUCERS - 0·2
Sugar - - -	17·0		FORCE-PRODUCERS 25·9
Malic acid - -	1·9		MINERAL MATTER 0·2
Dextrin - -	5·1		
Woody fibre -	1·8		
Colouring matter -	0·1		
Mineral matter -	0·2		

The constituents of 1 lb. of peaches are shown as follows :—

a. *Model of a peach.*
b. *Peach kernels.*
1. Water in 1 lb. of peaches—11 oz. 431 gr.
2. Albumen in 1 lb. of peaches—12 gr.
3. Sugar in 1 lb. of peaches—2 oz. 241 gr.
4. Malic acid in 1 lb. of peaches—126 gr.
5. Dextrin in 1 lb. of peaches—357 gr.
6. Woody fibre in 1 lb. of peaches—123 gr.
7. Coloring matter in 1 lb. of peaches—7 gr.
8. Mineral matter in 1 lb. of peaches—14 gr.

PEARS (Case 16). *Substances illustrating the chemical analysis of one pound of Pears.*

The eatable fruit of the pear is the produce of the *Pyrus communis,* a tree growing wild in Great Britain. Several hundred varieties of this fruit are cultivated in the orchards of Europe. They chiefly vary in the quantities of sugar and volatile oil they contain. The acetate of the oxide of amyl, mixed with spirits of wine, is sold under the name of essence of Jargonelle pears, and very closely resembles the flavor of pears.

100 parts of pears contain :—

Water - -	83·9	or,	WATER - - 83·9
Albumen -	0·2		FLESH AND FORCE PRODUCERS - 0·2
Gum - -	2·1		FORCE-PRODUCERS - 15·8
Sugar - -	11·5		MINERAL MATTER - 0·1
Woody fibre -	2·2		
Mineral matter	0·1		

The quantities of the ingredients of 1 lb. of ripe Jargonelle pears are shown as follows :—

a. 1 *lb. of pears.*
b. 1 *lb. of pears dried.*
1. Water in 1 lb. of pears—13 oz. 184 gr.
2. Albumen in 1 lb. of pears—14 gr.
3. Gum in 1 lb. of pears—147 gr.
4. Sugar in 1 lb. of pears—1 oz. 368 gr.
5. Woody fibre in 1 lb. of pears—154 gr.
6. Mineral matter in 1 lb. of pears—7 gr.
7. Essence of Jargonelle pears.

PEAS (Case 31). *Substances illustrating the chemical analysis of one pound of dry Peas.* The green pea contains more sugar and less casein than the dried pea.

Peas are rich in flesh-forming matter, in fact too rich as a simple diet, so that they are more wholesome when mixed with a less nutritive food, like the potato. The flesh-former in peas is LEGUMIN, closely resembling CASEIN.

100 parts of peas, air dried, contain :—

Water -	14·1
Casein -	23·4
Starch -	37·0
Sugar -	2·0
Gum -	9·0
Fat -	2·0
Woody Fibre -	10·0
Mineral matter -	2·5

or,

WATER -	14·1
FLESH AND FORCE PRODUCERS -	23·4
FORCE-PRODUCERS -	60·0
MINERAL MATTER -	2·5

The ingredients in 1 lb. of peas are shown as follows :—

a. 1 *lb. of peas*—b. 1 *lb. of pease-flour.*
1. Water in 1 lb. of peas—2 oz. 112 gr.
2. Casein in 1 lb. of peas—3 oz. 324 gr.
3. Starch in 1 lb. of peas—5 oz. 403 gr.
4. Sugar in 1 lb. of peas—140 gr.
5. Gum in 1 lb. of peas—1 oz. 193 gr.
6. Fat in 1 lb. of peas—140 gr.
7. Woody fibre in 1 lb. of peas—1 oz. 263 gr.
8. Mineral matter in 1 lb. of peas—175 gr.

One pound of dried peas, when digested and oxidized in the body, is capable of producing a force equal to 2,341 tons raised one foot high. The maximum of work which it will enable a man to perform is 468 tons raised one foot high. One pound of dried peas can produce at the maximum 3¾ oz. of dry muscle or flesh.

Varieties of cultivated peas from Egypt, Portugal, Canada, &c. are exhibited.

PEA-SOUP (Case 31). One of the most economical articles of diet is pea-soup. The following ingredients will make one gallon of palatable and nutritious soup :—Peas, 16 ounces; meat, 16 ounces; pot barley, one ounce; salt, an ounce and a half; onions, an ounce and a half; black pepper, 40 grains; and water four quarts. The peas should be steeped in three or four pints of the water (cold) for 12 hours. The meat should be boiled in five pints of the water for three hours. The peas should then be put in a bag and boiled with the meat one hour. The contents of the bag should then be pressed into the soup and the skins removed. The salt, pepper, onions, and pot barley should then be added, and the whole boiled for an hour. Water should be added from time to time to make up a gallon. If the water had been previously used in cooking animal or vegetable food, the soup will be rendered more nutritious.

One Pint of this Soup contains :—

	oz.	gr.
Water -	17	0
Legumin or Casein -	0	270
Starch -	1	0
Sugar -	0	16
Fat -	0	257
Gum -	0	40
Woody fibre -	0	41
Gelatin -	0	147
Mineral matter	0	103

or,

	oz.	gr.
WATER -	17	0
FLESH AND FORCE PRODUCERS -	0	270
FORCE-PRODUCERS -	2	64
MINERAL MATTER -	0	103

Whilst this and other soups are to be commended, it should be recollected that they cannot be made a substitute for solid food, such as bread and meat.

The ingredients of the above soup, together with the analysis, are exhibited in the case.

PHEASANTS. (*See* BIRDS USED AS FOOD.)

PHOTOGRAPHS OF CATTLE. (*See* BREEDS.)

PICKLES of various kinds. (*See* ACIDS.)

PIGS' BLOOD (Case 62). *Substances illustrating the chemical analysis of one pound of Pigs' Blood.*

The blood of animals is rich in restorative matters, and although when taken from an animal for the purpose of killing it, it is generally treated as refuse, it is sometimes used as food. Black-puddings are made with pigs' blood and oatmeal. A large proportion of blood remains in meat when killed in the ordinary way, and contributes to its nutritious qualities. In the killing of animals as little blood should be taken as possible.

100 parts of pigs' blood contain :—

Water - -	75·0
Albumen -	7·0
Fibrin and Globulin	16·0
Fat - -	0·6
Salt - -	0·9
Phosphates -	0·4
Iron - -	0·1

or,

WATER - -	75·0
FLESH AND FORCE PRODUCERS -	23·0
FORCE-PRODUCERS -	0·6
MINERAL MATTER -	1·4

The constituents of 1 lb. of pigs' blood are shown as follows :—

a. 1 *lb. of pigs' blood.*
1. Water in 1 lb. of pigs' blood—12 oz.
2. Albumen in 1 lb. of pigs' blood—1 oz. 52 gr.
3. Fibrin and globulin in 1 lb. of pigs' blood—2 oz. 246 gr.
4. Fat in 1 lb. of pigs' blood—42 gr.
5. Salt in 1 lb. of pigs' blood—62 gr.
6. Phosphates and other salts in 1 lb. of pigs' blood—28 gr.
7. Iron in 1 lb. of pigs' blood—7 gr.

PLANTAIN AND BANANA (Case 10). *Substances illustrating the chemical analysis of one pound of dried Plantains.*

Plantains and bananas are the fruits of various species of *Musa* which grow chiefly in equinoctial Asia, America, Africa, the islands of the Atlantic and Pacific oceans, and other parts of the world. They ripen their fruits all the year round, and in Egypt the banana is therefore called "one of the fruits of paradise." They contain but a small quantity of flesh-forming matter.

100 parts of dried plantains contain:—

Water	13·1	or,	WATER	13·1
Albumenoid matters	4·2		FLESH AND FORCE PRODUCERS	4·2
Starch	76·2		FORCE-PRODUCERS	79·5
Sugar	2·1		MINERAL MATTER	3·2
Fat	1·2			
Mineral matter	3·2			

The ingredients in one pound of dried plantains are shown as follows:—

a. *Model of the banana.*
b. 1 *lb. of dried plantains.*
1. Water in 1 lb. of dried plantains—2 oz. 43 gr.
2. Albumenoid matters in 1 lb. of dried plantains—294 gr.
3. Starch in 1 lb. of dried plantains—12 oz. 84 gr.
4. Sugar in 1 lb. of dried plantains—154 gr.
5. Fat in 1 lb. of dried plantains—77 gr.
6. Mineral matter in 1 lb. of dried plantains—224 gr.

POISONOUS PLANTS. (*See* DIAGRAMS.)

POOR MAN'S FILTER. (*See* FILTERS.)

PORK. (*See* FLESH USED AS FOOD.)

POTATO (Case 8). *Substances illustrating the chemical analysis of one pound of fresh Potatoes.*

The potato is an herbaceous plant producing annual stems from an underground tuber or root-stock which is the part that is used as an article of food. It has white flowers and a green fruit, which, like all the plants of the order to which it belongs, contain a poisonous principle. The native country of the plant is South America. It has been found wild in various parts of Chili, and also near Monte Video, Lima, Quito, Santa Fe de Bogota, and in Mexico. This plant was first cultivated in Spain in Europe; from thence it extended into Italy. It was first grown in the British Islands by Sir Walter Raleigh in his garden at Youghal in Ireland, but it was not generally cultivated in Great Britain till the middle of the last century. The only part of the plant employed as food is the tuber, which is a kind of underground stem. Upon this stem buds are formed which are called "eyes," and from these, by cutting ud the potato, the plant is propagated. The tubers of the wild potato are small in size, but by culture they may be very much enlarged. In this country many varieties of the potato are known

under the names of "kidneys," "rounds," "reds," "blues," "whites," &c. Many of these varieties are now disappearing, the "white," "kidney," and "round" potatoes being preferred to all others. The potato contains large quantities of water (75 per cent.), and less flesh and force-producing to the force-producing matters than any other plant cultivated for human food. It is therefore not adapted for consumption as a principal article of diet, and should only be employed as an addition to more nutritious kinds of food. It contains a variety of mineral matters, which also render it valuable as an article of diet. It has for many years been liable, in Europe, to a diseased condition, in which the water seems to be increased, and decomposition consequently readily sets in. The decayed parts are infested by a fungus, but this has not been shown to have anything to do with the production of the disease. Potatoes are largely employed in this country for the production of starch, which is used for a variety of purposes in the Arts. Potatoes are cooked in many ways, and all the varieties of food which can be obtained from the flour of the cerealia may be procured from the potato, as starch, maccaroni, vermicelli, &c.

The potato is poor in flesh-formers; 100 lbs. of fresh potatoes contain only $1\frac{1}{2}$ lb. of flesh-forming matter.

In 100 parts there are:—

Water - -	75·2
Albumenoid matters	1·4
Starch - -	15·5
Sugar - -	3·2
Dextrin - -	0·4
Fat - - -	0·2
Woody fibre -	3·2
Mineral matter -	0·9

or,

WATER - -	75·2
FLESH AND FORCE PRODUCERS -	1·4
FORCE-PRODUCERS	22·5*
MINERAL MATTER	0·9

The actual quantities of these ingredients in 1 lb. of fresh potatoes are shown as follows:—

a. 1 *lb. of fresh potatoes containing* 75 *per cent. of water* (*models only*).
b. 1 *lb. of potatoes after the water has been evaporated*—4 *oz.*
1. Water in 1 lb. of potatoes—12 oz.
2. Albumenoid matters in 1 lb. of potatoes—100 gr.
3. Starch in 1 lb. of potatoes—2 oz. 219 gr.
4. Sugar found in 1 lb. of potatoes—223 gr.
5. Dextrin or gum in 1 lb. of potatoes—30 gr.
6. Fat in 1 lb. of potatoes—15 gr.
7. Woody fibre in 1 lb. of potatoes—223 gr.
8. Mineral matter in 1 lb. of potatoes—64 gr.

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* In the above analysis of the Potato the force-producers include gum, pectin, and cellulose or woody fibre, which, as they are generally indigestible, probably do not act upon the system. They are usually, however, in small quantities.

One pound of potatoes, when digested and oxidized in the body, is capable of producing a force equal to 618 tons raised one foot high. The maximum of work which it will enable a man to perform is 124 tons raised one foot high. 1 lb. of potatoes can produce at the maximum 100 grains of dry muscle or flesh.

POTATO. (*See also* SWEET POTATO.)

POTATO (Cases 114 and 115). Preparations of various kinds from the potato, such as sago, tapioca, dextrin, maccaroni, vermicelli, flour, sugar or glucose, vinegar, semola, preserved potato, "tuberculine" (the alimentary principle of the potato), &c.—From Sweden, Prussia, France, and Brazil.

POTATO (Case 114). Series of products obtained from the potato. From Holland. International Exhibition of 1862.

POTATO SPIRIT. (*See* DISTILLED SPIRITS.)

PRAWNS and SHRIMPS. (*See* CRUSTACEOUS ANIMALS.)

PRESERVED or BOTTLED FRUITS (Case 108). The following examples are shown in the case:—apples, gooseberries, greengages, damsons, raspberries, cherries, apricots, peaches, rhubarb stalks. — Presented by Messrs. Fortnum and Mason.

PRESERVED FRUITS. A variety of preserved fruits, including pineapples, loquats, litchees, tamarinds, clove-buds, &c. From the French Colonies.—Presented by the French Commissioners, International Exhibition of 1862.

PRESERVED FRUIT (Case 108). Native fruit preserve from New Zealand. In the original package of plaited fibre.—Presented by O. E. Biddulph, Esq., Hill House, Epsom.

PRESERVED MEATS (Case 71). Various tin canisters, hermetically closed, containing beef, soup, and other animal food. Both animal and vegetable matters can be preserved for an indefinite time by submitting them to heat so as to drive out the air from the vessels in which they are contained by the steam which is generated, and then sealing the aperture so thoroughly as to prevent the access of atmospheric air.

PRESERVED MEATS, FISH, &c. (Case 71). In this case are exhibited specimens of smoked and dried tongues, portable soup, anchovies in oil and salt, concentrated meat, Russian botargo, dried beef from Uruguay, South America, &c.

PRESERVED MEATS (Case 71). Examples in illustration of the process invented by Dr. Morgan, with an explanatory

label. — Presented by Dr. Morgan, 23, Steven's Green, North Dublin.

PRESERVED VEGETABLES. (*See* COMPRESSED VEGETABLES.)

PRINCIPLES OF FOOD. (*See* CHEMICAL PRINCIPLES OF FOOD.)

PRUSSIC or HYDROCYANIC ACID. (*See* FLAVORERS.)

PUBLIC DIETARIES (Case 33). The experience of nations in the support of persons depending upon public diets, such as the soldier, sailor, pauper, or prisoner, gives data for determining the quantity of flesh-formers and force-producers required for support under different conditions, however varied may be the substances composing the dietaries. Division I. shows the amount of flesh-formers, and of the carbon (charcoal) in the food of soldiers and sailors in different countries. Carbon is the element which chiefly determines the value of the force-producers. As a general result, men in fighting condition require a daily supply of 5 or 6 oz. of flesh-formers, and 10 oz. of carbon.

1. The English soldier requires, both in this country and in India, 5 oz. daily of flesh-formers in food. This must also contain 10 oz. of carbon.

2. The English sailor receives 5 oz. of flesh-formers in food. He consumes 10 oz. of carbon daily.

2*a*. The English sailor in his salt meat dietary has nearly 6 oz. of flesh-formers daily, and 12 oz. of carbon. This may be necessary from the less digestible nature of the food. The quantities appear to be too high.

3. The Dutch soldier, *when in war*, receives daily 5 oz. of flesh-formers in his food, along with 10½ oz. of carbon.

3*a*. The Dutch soldier, *when in peace*, or in garrison, has a lower diet, in which there are only 3½ oz. of flesh-formers, and 10 oz. of carbon. With this diet he is below fighting condition.

4. The French soldier, although his diet is of very different character from that of the English soldier, still receives nearly the same amount of flesh-formers in his food (4¾ oz.), and 12 oz. of carbon. The French soldier, unlike the Dutch soldier, is thus always kept in fighting condition.

5. The Royal Engineers, now occupied in the Museum of South Kensington, are found to eat $4\frac{9}{10}$ oz. of flesh-formers and 13 oz. of carbon daily.

In Division I. are shown the dietaries of soldiers and sailors when kept in fighting condition. When the soldier returns to Chelsea Hospital or the sailor to Greenwich Hospital for repose, he does not require to have such a large amount of flesh-formers in his food; these are then reduced to between three and four ounces daily. The carbon, however, remains high, perhaps higher than is necessary. Paupers in work-

houses, not being exposed to much labour, require less flesh-formers in food than active soldiers and sailors. Boys 10 years of age, at school, receive about one-half the flesh-formers of active men, and about three-fourths the quantity of carbon. Ladies, in luxurious repose, consume about the same amount as young schoolboys. It must always be remembered that flesh-formers can be, and constantly are, used in the system as force-producers; but the substances classified above as force-producers cannot be applied to the formation of flesh.

1. Greenwich pensioners have 3½ oz. of flesh-formers and 10 oz. of carbon in their daily supply of food.

2. Chelsea pensioners have 4 oz. of flesh-formers and 9¾ oz. of carbon in their food daily.

3. The old men of Gillespie's Hospital in Edinburgh have 3 oz. of flesh-formers and 10 oz. of carbon daily.

4. Paupers. Taking the average of all the workhouses in the kingdom, it is found that paupers have daily 3¼ oz. of flesh-formers and 8¼ oz. of carbon.

5. The boys of the Royal Naval School at Greenwich have 2½ oz. of flesh-formers and 7½ oz. of carbon in their food daily.

6. The boys of Christ's Hospital in London have 2½ oz. of flesh-ormers and 7 oz. of carbon in their food.

Rabbits. (*See* Hares and Rabbits.)

Raisins. (*See* Viniferæ.)

Reptiles used as Food. The reptiles which are eaten in this country are few in number. Their flesh, however, is white and delicate, and rich in gelatine and fat. No accurate analysis has hitherto been published of the composition of the flesh of these animals. The only one of these animals consumed in any quantity in Great Britain is the green turtle (*Chelonia Mydas*), the upper shell of which, presented by Messrs. Ring and Brymer, is exhibited. This creature inhabits the sea off the West India Islands and the coast of South America. It sometimes weighs as much as 600 or 700 pounds. It deposits its eggs (considered a delicacy) on the shore, and is captured at this period. The celebrated "turtle soup" is made from its flesh.

The land tortoise is common on the coasts of the Mediterranean, and is eaten by the inhabitants of Italy and the Levant. The flesh is gelatinous, fat, and rich, and similar in flavour to the green turtle. A small fresh-water turtle is eaten in America, and also used as food in this country under the name of terapin.

The edible frog (*Rana esculenta*) is larger than the common frog of this country, and is a native of most of the countries of Europe. The flesh of this frog is very delicate,

and contains less fat and gelatine than that of the turtle or tortoise. It has the flavour of chicken. In Paris, Vienna, and the other large cities of Europe, where it is esteemed a great luxury, only the hind quarters are dressed and brought to table. The common frog is also eaten on the Continent.

Various other forms of reptiles are eaten in different parts of the world. The crocodile, the alligator, and cayman are eaten in the countries which they inhabit. The iguana is eaten in Quayaquil, and regarded as a great luxury. The tegu or teguixin, is eaten in the Brazils; and one of the greatest delicacies of the table in Mexico is the axolotl, which inhabits the lake of Mexico. In Rome the flesh of the green lizard is eaten.

The snakes are less eaten than any form of reptile; but even these creatures have their admirers, and certain species are regarded as delicacies by the natives of the countries in which they live.

REPTILES USED AS FOOD (Case 68). Stuffed and mounted specimen of the Iguana. From Demerara.—Presented by Mr. E. J. Johnson, Broomlands, Demerara.

RICE (Case 9). *Substances illustrating the chemical analysis of one pound of Rice.*

This plant (*Oryza sativa*) belongs to the natural order of grasses (*graminaceæ*). Two other species are said to be cultivated, *Oryza latifolia* and *Oryza Nepalensis*. Rice is a native of the East Indies, and, unlike many of the cultivated cereals, is found wild about the borders of lakes in the Rajahmundry district of British India. It is the principal article of diet of the Hindoos, Chinese, and other Oriental nations.

Wild rice does not yield so much as the cultivated varieties. Rice is now extensively cultivated in Asia, from whence it has extended to the southern parts of Europe, and been introduced into America. It is produced in great abundance in the marshy grounds of North and South Carolina.

Rice is brought into this country from various parts of the world, and, in 1858, 3,692,000 cwts. were imported, worth 1,500,000*l*. A large number of varieties are known in the countries where it is cultivated. The most abundant varieties are known under the names of "common rice," "early rice," "mountain rice," and "clammy rice." Rice in the husk is known by the name of "paddy."

When employed in this country, Rice is used as an adjunct to other kinds of food more rich in flesh-formers. Boiled,

as an addition to meat, or in the form of pudding or curry, it may be judiciously used as a variety in diet, especially in the food of the young. It cannot be substituted for any length of time for potatoes or other fresh vegetables, as under such circumstances scurvy is likely to be produced.

Rice, though used largely as an article of food, is poor in flesh-formers, which scarcely amount to 7 parts in 100; and from its small quantity of fat it is not a laxative food. In force-producers it is rich.

100 parts of rice contain the following ingredients:—

Water	13·5	or,	WATER	13·5
Gluten	6·5		FLESH AND FORCE PRODUCERS	6·5
Starch	74·1			
Sugar	0·4			
Gum	1·0		FORCE-PRODUCERS	79·5
Fat	0·7			
Woody fibre	3·3		MINERAL MATTER	0·5
Mineral matter	0·5			

The case shows the ingredients in 1 lb. of rice.

a. 1 *lb. of rice with its husk.*
b. 1 *lb. of rice deprived of its husk.*
1. Water in 1 lb. of rice—2 oz. 70 gr.
2. Gluten in 1 lb. of rice—1 oz. 17 gr.
3. Starch in 1 lb. of rice—11oz. 380 gr.
4. Sugar in 1 lb. of rice—27 gr.
5. Gum in 1 lb. of rice—68 gr.
6. Fat in 1 lb. of rice—48 gr.
7. Woody fibre in 1 lb. of rice—230 gr.
8. Mineral matter in 1 lb. of rice—34 gr.

One pound of rice, when digested and oxidized in the body, is capable of producing a force equal to 2,330 tons raised one foot high. The maximum of work which it will enable a man to perform is 466 tons raised one foot high. One pound of rice can produce at the maximum only 1 oz. of dry muscle or flesh.

In the case are exhibited samples of rice from Central Africa, Carolina, Cochin China, Damietta, Egypt, Greece, India, Java, Madagascar, Peru, Portugal, Russia, Spain, Turkey, and a specimen grown in the Royal Gardens at Kew.

RUM. (*See* DISTILLED SPIRITS.)

RYE (Case 29). (*See also* CEREALS.) *Substances illustrating the chemical analysis of one pound of Rye.*

Rye was formerly extensively cultivated in this country. It is still much grown in the north of Europe, and rye bread is a favourite diet of the people in that part of the world. It is subject to a disease which gives the grains a spined or horned appearance. These grains are produced by the attacks of a fungus, and are called ergot of rye. The ergot is used medicinally, and when taken as a food it produces poisonous effects. Rye yields a very nutritious

flour, and when made into bread assumes a dark brown appearance. Hence it is called " black bread."

Rye is grown much more in Germany, Russia, and Norway than in England. In composition it more resembles wheat than either oats or barley. Rye, like wheat, forms a light spongy bread.

100 parts of rye contain :—

Water	13·00
Gluten	10·79
Albumen	3·04
Starch	51·14
Gum	5·31
Sugar	3·74
Fat	0·95
Woody fibre	10·29
Mineral matter	74

or,

Water	13·0
Flesh and Force Producers	13·8
Force-producers	71·5
Mineral Matter	1·7

The ingredients in 1 lb. of rye are shown as follows :—

a. 1 *lb. of rye.*
1. Water in 1 lb. of rye—2 oz. 35 gr.
2. Gluten in 1 lb. of rye—1 oz. 318 gr.
3. Albumen in 1 lb. of rye—213 gr.
4. Starch in 1 lb. of rye—8 oz. 79 gr.
5. Gum in 1 lb. of rye—371 gr.
6. Sugar in 1 lb. of rye—262 gr.
7. Fat in 1 lb. of rye—66 gr.
8. Woody fibre in 1 lb. of rye—1 oz. 284 gr.
9. Mineral matter in I lb. of rye—122 gr.

Samples of rye grown in France, Belgium, Russia, Spain, Turkey, Sweden, and the United States are exhibited in the case.

Sago. (*See* Starch.)

St. John's Bread. (*See* Carob Beans.)

Salads.

Although many things eaten as salads contain other constituents of food besides mineral matters, their beneficial action in diet is mainly due to the latter. The practice of eating salads is not so common in Europe as before the introduction of the potato, which to a certain extent supplies the same kind of mineral matters to the blood. The practice of eating salads is, nevertheless, to be highly commended, and many plants formerly much used might now be consumed in this way with much advantage. The great recommendation of salads is, that the plants thus consumed are uncooked, and contain, consequently, a larger quantity of mineral matter than vegetable substances which have been boiled in water. On the other hand, salads not having been cooked, are liable to introduce into the system the living germs of parasites, and the active principles of some kinds of zymotic disease. The following plants, specimens

of which are from time to time exhibited in the Collection, are consumed in this country as salads. They may be eaten with salt alone, or mixed with oil, vinegar, and pepper:—

1. Lettuce.—This plant is a cultivated variety of the wild lettuce, *Lactuca virosa.* It contains in its juice an active principle, which in large quantities exercises a narcotic influence on the human system.

2. The water cress.—This plant grows wild in ditches and damp places in this country, and is also extensively cultivated in the neighbourhood of London. It contains a large quantity of mineral matter, and in some districts is found to contain iodine.

3. The endive.—This plant is probably a variety of the common chicory. It is cultivated extensively on the continent, and its blanched leaves are eaten as a salad. It can be obtained in the winter. It has a slightly bitter taste, and acts as a tonic on the system.

4. Celery.—When wild this plant contains an acrid principle, which is poisonous, but by culture its stalks are blanched, and it then becomes an agreeable and valuable article of food.

5. Garden cress.—This plant is not a native of Great Britain, but it is easily cultivated, and extensively used as an early spring salad. The seeds are sown with those of mustard, and the young plants are both eaten together under the name of "mustard and cress."

6. Red beet.—There are two varieties of this plant used as salad. First, a variety called *la Carde,* which has a small root and large leaves; the latter are eaten in the same way as lettuce. The other variety is called *Betterave,* in which the roots are largely developed. The roots are boiled and sliced, and eaten with vinegar, oil, pepper, and salt, as other salads.

7. The radish.—The roots of this plant are eaten uncooked, and, like the family to which they belong, contain a subacrid oil, which gives them an agreeable flavour. They are less digestible than many other plants eaten as salad.

8. Lamb's lettuce or corn salad.—This plant is a native of Great Britain, and is often cultivated for use as a salad. The leaves for this purpose should be cut young, or they will have a disagreeable bitter taste.

9. Common sorrel.—The acid taste of this plant depends on the presence of oxalic acid. It is much used as a salad in France.

10. Dandelion.—This plant, though very common in England, is not much used as a salad. It has, however, the flavour and properties of lettuce, and is extensively employed as a salad on the continent.

Many other plants have been used as salads in this country, and a large addition might be made to the list of foreign plants easily cultivated, or British wild plants, which might be consumed with advantage in the form of salad.

Salep, or Saloop. (*See* Starch.)

Salt (Case 5). (*See also* Minerals in Food.)

Common salt is a chloride of sodium, and exerts an extraordinary influence on animal as well as vegetable life. All marine animals and plants seem to have their existence determined by this substance. It enters into the composition of the human body, and all over the world man uses it, when he can obtain it, in its mineral form, as an addition to his food.

Salt occurs in large quantities in the bowels of the earth, and in many parts of Great Britain and the continent of Europe it is worked for the purpose of supplying the market. It is obtained in the form of rock salt, and in brine springs, both of which contain many impurities, but, when prepared, it is sold under the names of "bay salt" and "fine salt."

Salt has the power of preventing the decomposition of animal and vegetable substances. It is extensively employed in this country, sometimes in conjunction with saltpetre (nitrate of potash), for the preservation of pork and beef. In other countries it is employed for the preservation of fruits and vegetables, and might certainly be made more extensive use of in this country than it is for the preservation of the latter for winter use.

Samples of salt from various parts of the world are exhibited in the case.

SALT (Case 5). A small sample of the salt soil in the neighbourhood of the city of Mexico, from which salt is made by lixiviation. Also a specimen of the salt so obtained.—Presented by Andrew Murray, Esq.

SAUCES of various kinds (Case 43).—Presented by Messrs. Batty and Co., Finsbury Pavement, London, E.C.

SEA-WEEDS USED AS FOOD (Case 7). Amongst the sea-weeds (*Algæ*) which have been used as articles of diet, none is better known than the *Chondrus crispus*, which, under the name of Carrageen moss, Irish moss, and pearl moss, has been for a long time used in Europe. This and other sea-weeds have been occasionally had recourse to by the poor inhabitants of the sea-shores of Europe, more especially Ireland, when the ordinary corn or potato crop has failed. They contain, however, but little nutritious matter, and persons soon famish who live upon nothing else. Examples of the following sea-weeds are exhibited in the case:—

1. Carrageen moss, Irish moss, pearl moss (*Chondrus crispus*). It grows on the rocky sea-shores of Europe, and when washed and dried, and then boiled with water, makes a mucilaginous decoction, which has been recommended in consumption, coughs, diarrhœa, and other diseases.

2. Laver, sloke, slokam (*Porphyra laciniata*). It is found on all our sea-shores, and when employed as food is salted and eaten with pepper, vinegar, and oil.

3. Green laver, green sloke, oyster green (*Ulva latissima*). The ulva is not so good to eat as the porphyra.

4. Tangle, sea ware, sea girdles, sea wand, red ware (*Laminaria digitata*). It is cooked by boiling for a long time, and adding pepper, butter, and lemon juice.

5. Badderlochs, hen ware, honey ware, murlins (*Alaria esculenta*). (*See* DIAGRAM.) The part of the plant which is eaten is the thick middle rib which runs through the frond.

6. The dulse of the south-west of England is the *Iridea edulis* of botanists. It is said to resemble in its flavour roasted oysters.

7. Dulse of the Scotch, dellisk, dellish, duileisg, water-leaf (*Rhodymenia palmata*). The Icelanders use it as an article of diet, under the name of the sugar fucus. It is also used to flavour soups, ragouts, and other dishes.

Several other sea-weeds are employed as food. In China the people are very fond of them, and many kinds are collected and added to soups, or are eaten alone with sauce. One of these, the *Plocaria tenax*, is called Chinese moss. The Corsican moss is the *Plocaria Helminthoorton*, and is found on the coasts of the Mediterranean. Another seaweed was recently imported into London under the name of Australian moss (*Eucheuma speciosum*), but it tastes too strongly of the sea to be pleasant. *Durvillea edulis* is another sea-weed, used at Valparaiso as food.

Specimens of the two latter forms of algæ have been presented to the collection by Dr. Harvey, of Dublin.

SEA-WEEDS. Frame containing nine specimens of various kinds of edible sea-weeds.—Presented by Mr. Grattan.

SEA-WEEDS. Frame containing eight specimens of edible sea-weeds.—Presented by Mr. M. C. Cooke.

SEA-WEEDS, MOSSES, LICHENS, &c. (Case 7). A variety of samples with substances obtained from kelp.—Purchased from Mr. M. C. Cooke.

SEEDS EATEN AS FOOD. (*See* OILS, &c.)

SHARKS' FINS. (*See* CHINESE FOOD.)

SHELL-FISH. (*See* MOLLUSCOUS ANIMALS.)

SHELL FRUITS (Case 20). (*See also* OILS, &c.) In this case are exhibited examples of the following shell fruits:—Brazil nuts, hickory nuts, walnuts, hazel nuts, pistachio nuts, butter nuts, sweet almonds, bitter almonds, "sapucaya" nuts, or seeds of various species of *Lecythis*, &c.—Mostly presented by Messrs. Fortnum and Mason, Piccadilly, London.

SIAMESE FOOD PRODUCTS, &c. (Cases 85 and 86). A collection of examples of food and other products from Siam, consisting of spices, dried fish, dried meat, sugars, tobacco, fish maws, edible birds' nests, sea slugs, sharks' fins, deers' sinews, ground nuts, varieties of beans and other seeds, betel nuts, &c. &c.—Received from the Foreign Office in June 1861.

SOAP TEST, for ascertaining the degree of hardness in water. (*See* WATER.)

SOKE, or SAKI, a Japanese spirit or liqueur. (*See* DISTILLED SPIRITS.)

SORGHUM SACCHARATUM. (*See* SUGAR MILLET.)

SPICES. (*See* CONDIMENTS AND SPICES.)

STARCH (Cases 6 and 116).

The substance called Starch is found very abundantly in the vegetable kingdom. Its presence was at one time regarded as characteristic of plants, but it has recently been found in animals. It occurs in the form of irregularly-shaped granules, which vary in size from the $\frac{1}{400}$ to the $\frac{1}{2000}$th of an inch in diameter. (*See* DIAGRAMS.)

Starch is turned blue by iodine, which is the best test of its presence. It is composed of carbon, hydrogen, and oxygen, of which carbon constitutes nearly one-half by weight, and the hydrogen and oxygen are in the proportions to form water. When starch is taken as an article of diet, it is oxidized in the system, and contributes to the production of muscular force and animal heat. Starch is readily converted into glucose or grape sugar by the action of nitrogenous substances, especially the salivin of the saliva, and it is in the form of glucose that it enters the blood of animals. All starch in diet not converted into glucose is waste. Starch is therefore less readily convertible into aliment than sugar.

Starch is abundantly present in all the more common forms of vegetable diet. It exists in a state of almost absolute purity in the substances known as arrowroot, tapioca, and sago. These substances, from whatever source obtained, contain little or no nutritious or flesh-forming food, and consequently ought never to become the substantive diet of human beings.

One pound of starch, if digested and oxidized in the body, will produce a force equal to 2,427 tons raised one foot high. The maximum of work which it will enable a man to perform is 485 tons raised one foot high. It cannot produce any flesh or muscle.

Common starch, which is used for domestic and manufacturing purposes, is obtained from wheat, rice, potatoes, and other sources. Sago is a form of starch obtained from several kinds of plants. That which is most commonly used in Europe is the produce of the sago palm (*Sagus lœvis*), which grows in the islands of the Indian archipelago. (*See* DIAGRAM.) The sago is obtained from the cellular tissue in the interior of the trunk of the tree. Other palms, as the *Sagus rumphii* and the *Saguerus saccharifera,* also yield sago. A coarse kind of sago is also obtained in the East Indies from various species of plants belonging to the order *Cycadaceæ.* Such are *Cycas circinalis, Dion edule,* and *Encephalartos horrida.* (*See* DIAGRAM.)

Starch is obtained from the roots of the *Arum maculatum,* and is eaten in this country under the name of Portland sago.

Arrowroot is also a name given to various forms of starch, obtained more especially from the root-stocks of plants. The most common

source of arrowroot is the *Maranta arundinacea* (*see* DIAGRAM), which is a native of tropical America and the West Indian islands. This plant yields the best West Indian and Bermuda arrowroots. Another species, the *Maranta Indica*, is said to yield the East Indian arrowroot. The "*Tous les Mois*" is produced by a plant belonging to the same order, the *Canna edulis*, which is a native of Peru. Arrowroot is prepared from the root of the water-lily in China.

Tapioca is starch from the Mandioc plant, *Janipha Manihot* (*Jatropha Manihot*) (*see* DIAGRAM). This plant is a native of South America, and belongs to the order *Euphorbiaceæ*. It contains hydrocyanic acid, and is very poisonous. The poison is, however, separated from the root, and after preparation it yields cassava and tapioca. Cassava is formed into cakes and eaten by the natives.

Tapioca is extensively consumed in Europe for the same purposes as sago and arrowroot.

Cakes and various other preparations are made from arrowroot, sago, and tapioca.

Salep or *Saloop* (Case 87) consists principally of starch, and is prepared from the roots of the common male orchis (*Orchis mascula*). When it is boiled it forms an agreeable article of diet, and was commonly used in this country before the introduction of tea and coffee. Sassafras chips were frequently introduced into the decoction for the purpose of giving it a flavour. The roots of the *Orchis maculata* also yield an inferior kind of salep. Although now almost entirely disused in this country, it is still used in Turkey and the East.

Starch differs in its physical and chemical properties according to the plants from which it is obtained. Thus, *Inuline* is a form of starch obtained from the Elecampane (*Inula Helenium*), a plant not uncommon in this country.

A variety of samples of the above described starches are shown in the cases, as well as an extensive series of the rarer forms from various parts of the world, many of which were received from the foreign divisions of the International Exhibition of 1862.

SUBSTANCES USED IN THE ADULTERATION OF FOOD. (*See* ADULTERATION OF FOOD.)

SUBSTITUTES FOR COFFEE. (*See* COFFEE.)

SUBSTITUTES FOR TEA. (*See* TEA.)

SUGAR, SUGAR CONFECTIONS, &c.

Sugar has a chemical composition very nearly resembling starch, but it differs in both chemical and physical properties. Sugar is soluble in water, whilst starch is only diffusible through it. Sugar undergoes the process of fermentation, which starch does not. Sugar has a sweet taste, whilst starch is almost tasteless. Starch is, however, convertible into sugar by the agency of acids or of nitrogenous substances.

The action of sugar on the system is identical with starch. As it is more readily absorbed into the blood than starch, it is better adapted as a force-producer for the young.

Hence it is found supplied to the young in all the mammalia, in the milk secreted by their mothers. That it is adapted for the young is shown by the instinctive propensity children display to partake of this form of diet. Although adapted for children, the facility with which it decomposes renders it frequently injurious to adults.

One pound of sugar, if digested and oxidized in the body, produces an amount of force equal to 2,077 tons lifted one foot high. The maximum amount of work which it will enable a man to perform is 415 tons raised one foot. It cannot produce any muscle or flesh.

Cane sugar is found very generally in plants at certain periods of their growth. Thus it is found during germination in the seeds. This is well illustrated in the process of malting, which consists in allowing the seed of the barley to germinate; and when the starch has been converted into sugar, the process of growth is arrested, and sugar secured for the purposes of fermentation. All kinds of grain may be thus converted into malt, and used for the purposes of making wine, beer, and distilled spirits.

Another period at which plants contain sugar is previous to the unfolding of their buds. Thus, in the spring of the year, the sap of the birch (*Betula alba*) contains sugar, and in Scotland it is collected and fermented, and birch wine is manufactured. Large quantities of sugar are annually obtained in America from the sap of the sugar maple (*Acer saccharinum*). Many other trees yield sugar in their sap.

The grasses and the palms contain the largest quantity of sugar in their sap when their leaves are perfected, and they are about to blossom. This is the case with the sugar-cane (*Saccharum officinarum*), the plant from which the chief supplies of sugar are obtained which are consumed in this country. The jaggary palm (*Caryota urens*), the cocoa-nut palm (*Cocos nucifera*), the wine palm (*Saguerus saccharina*), and many others, yield sugar in their sap, which is extensively employed by the natives of tropical climates as an article of diet, and for the production of wine. Sugar has been obtained in Indiana in the United States of America from the stalks of the maize, by cutting the plant down previous to its period of flowering.

All the ordinary grasses contain sugar, and those which are found best for feeding cattle contain the largest quantities.

In all cases the preparation of the sugar depends on the same principles. The juice of the plant containing the sugar in solution is submitted to a process of purifying and evaporation, and the sugar is allowed to crystallize. This sugar, as it is obtained from the sugar-cane in the West Indies, is called "brown sugar." Sugars brought in this state from our own colonies are called "Muscovado sugars," whilst those brought from foreign colonies are called "clayed sugars." The difference consists mainly in the fact that the latter are drained by applying damp clay at the top of the hogshead.

The brown sugar is refined in this country. Formerly, this process was effected by boiling the sugar with bullocks' blood and other albuminous substances. Now, lime is more frequently used, and processes have been patented in which burnt alumina and sugar of lead are employed. Specimens of the alumina process are exhibited by Messrs. Oxland, of Plymouth.

Sugar is the basis of all kinds of confectionery, of which a variety of specimens are exhibited.

When organic substances are mixed with sugar they can be kept for a great length of time without decomposition. From a knowledge of this

fact has arisen the practice of making "jellies," "jams," and "preserves" of fruits in sugar. Apples, pears, apricots, cherries, damsons, plums, gooseberries, currants, and other fruits are thus preserved. A collection of these is exhibited by Messrs. Batty and Son, of London, and another by Messrs. Fortnum and Mason.

Fruits, after being saturated with sugar, are also preserved and kept dry. A case of preserved fruits of various kinds is exhibited by Messrs. Fortnum and Mason. It is in this way that fruits are brought to this country, which otherwise would not be seen on account of their perishing nature.

In the collection of Chinese foods there will be found a number of curious fruits and substances which could only be preserved by the aid of sugar.

Of the various forms of sugar, glucose appears to be the only fermentable form, and when cane and milk sugar are fermented they first assume the form of glucose. This form of sugar is most commonly found in fruits, and it is especially abundant in the fruit of the grape; hence it is called grape sugar. Grapes, when dried, are eaten on account of the glucose they contain. They are known in the shops under the name of "plums," "raisins," and "currants." The latter word is a corruption of Corinth, the small grape yielding this being cultivated in the vicinity of Corinth, in Greece.

The sugar that is used in this country is obtained from the sugar-cane. The sap of this plant is evaporated by boiling, and when cooled down it produces "brown sugar" and "treacle." The latter is the uncrystallized sugar that runs away from the crystallized mass. The brown sugar is purified in this country, and becomes the "loaf" or "refined" sugar of our shops. Confectionery and sweetmeats of all kinds are prepared from this sugar.

In other countries other plants are employed for yielding sugar. In France and Germany it is procured from the beet-root (*Beta vulgaris*); in America from the maple (*Acer saccharinum*) and the maize (*Zea Mays*); in the East Indies from palm trees, more especially the jaggary palm (*Caryota urens*).

SUGAR. Three specimens of the sugar-cane grown on the Grove sugar estate, Montserrat, West Indies.—Presented by J. Marshall Sturge, Esq.

SUGAR (Case 110). A series of raw and refined sugars from various parts of the world, illustrating the process of sugar refining, with a diagram of a sugar refinery.—Presented by Messrs. D. Martineau and Sons, Christian Street, St. George's-in-the-East, London, E.C.

SUGAR (Cases 112 and 113). Samples of raw and refined sugar from Cuba, Penang, Jamaica, Porto Rico, Mauritius, Bengal, and Demerara; also refiners' sugar, termed "pieces," and refuse sugar from refineries.—Presented by Messieurs Fortnum and Mason. A collection of raw and refined sugars from the French colonies of Réunion, Martinique, Guiana, Guadaloupe, Mayotte, Tahiti, and Cochin-china.—Presented by the Imperial Commissioners for France, International Exhibition, 1862. Also a series

of samples of raw sugars from Java.—Presented by the Commissioners for the Netherlands, International Exhibition, 1862.

SUGAR (Case 17). A series of samples illustrating the refining process of Messrs. Oxland, of Plymouth, and presented by them.

SUGAR FROM SOURCES OTHER THAN THE SUGAR-CANE (Case 17). The following are the specimens exhibited :—Palm (species not known) sugar, date sugar, coco-nut sugar, beet-root sugar, maple sugar, and sorghum sugar, or sugar from the sugar millet.

SUGAR (Case 113). White and brown sugar, from Formosa. —Presented by R. Swinhoe, Esq.

SUGAR. Group modelled in sugar, after the painting by Horace Vernet of "Rebecca at the Well."—Presented by the French Commissioners, International Exhibition of 1862.

SUGAR CONFECTIONERY (Cases 109 and 111). Almonds, comfits, candy, and a variety of table ornaments made of sugar.—Presented by Messrs. Fortnum and Mason.

SUGAR CONFECTIONERY (Case 109). Various specimens of ornamental sugar work, with samples of the materials used in making the same.—Presented by T. K. Callard, confectioner, 4, Blenheim Terrace, St. John's Wood, London, N.

SUGAR CONFECTIONS (Case 111). A series of fruits preserved with and without sugar, sugar confectionery, ornamental sugar work, &c.—Presented by Messrs. Fortnum and Mason.

SUGAR CONFECTIONS. Lozenges of different sorts.—Given by the maker, W. Bainbridge, 408, Strand.

SUGAR (Case 17). Samples of maple sugar.—Presented by Dr. Hitchcock, Springfield, Massachusetts, United States.

SUGAR (Case 17). Sugar from the sugar millet. (*See* SUGAR-MILLET.)

SUGAR-MILLET (*Sorghum saccharatum*) (Case 17). A grass has lately been introduced into this county from the north of China, which is used for the manufacture of sugar. The following is a brief account of this plant :—

THE CHINESE SUGAR-MILLET, OR SUGAR SORGHO.

This plant, like the sugar-cane, belongs to the family of grasses, and is cultivated in the north of China for the sugar it contains. It has

been grown successfully in France, Lombardy, Tuscany, Russia, Algeria, the United States, and Australia. Sugar has been obtained from the plant in France, and syrup, rum, wine, cider, and vinegar have been made from it. It is highly recommended as a fodder for cattle, the produce being variously estimated at from 20 to 50 tons per acre. A variety of this millet, or an allied species, is cultivated by the Zulu kaffirs under the name of *Imphee,* which likewise yields sugar, and the seeds of which are eaten by the kaffirs. Poultry and other animals may be fed on the seed of the sugar millet. The sugar (see specimen in case 17) is said to be most abundant after the seed is ripened. It remains in the plant long after it is gathered, and may be extracted from the cane when it is quite dry. In France starch and semola have been prepared from the seeds.

SUGAR, SUBSTANCES RESEMBLING (Case 107). Standing between starch and sugar are many vegetable substances having a chemical composition closely allied to them, but differing in physical properties. Some of these enter into the composition of food, although it is very doubtful if they act on the system in the same way as starch and sugar.

Dextrin is formed in plants whilst starch is passing into the composition of sugar. Like sugar, it is soluble in water, but not sweet.

Gum may be regarded as fixed dextrine; it is soluble in water, but is incapable of being converted into sugar, and has no sweet taste. Although gum enters largely into some kinds of food, it does not enter the blood, or act as an aliment. It may be therefore properly regarded as an accessory food. Sugar is added to it, and it is used in the manufacture of lozenges. These are flavoured with various substances, as in the case of the *pâte de jujubes.*

Liquorice is found in many plants, but it is separated from the juice of the liquorice plant (*Glycyrrhiza glabra*). Like gum, it is soluble in water, and has the sweet taste of sugar. It differs from sugar in not being fermentable. It is obtained from the root of the liquorice plant in the form of an extract, and comes to this country in solid sticks, which are sold under the name of "Spanish juice." This is boiled down and refined, and sold under the name of "refined or pipe liquorice." The liquorice plant is cultivated extensively at Pontefract or Pomfret, in Yorkshire, and a manufacture of the liquorice is carried on in that town. The liquorice is made into cakes, which are called "Pomfret cakes." Liquorice, like gum, does not act as an aliment in the system.

Manna is another sweet substance, soluble in hot water, but not capable of fermentation. It is obtained for medicinal purposes from a species of ash, *Fraxinus ornus.* Several other plants yield manna, and it is used in some countries as an article of diet. Its value is, however, doubtful. This substance has sometimes been supposed to be the "manna" of Scripture, but the putrescent nature of that substance, and the absence of dietetical properties in the subject in question, renders this supposition exceedingly doubtful.

Various kinds of gum, liquorice, Pomfret, or Pontefract cakes, marshmallow roots, and lozenges ("pâte de Guimauve"), "salep" or "saloop," (*see* STARCH), cassia pods,

manna, and Australian manna, are exhibited in the case illustrating substances resembling sugar.

SULTANAS. (*See* VINIFERÆ.)

SUPPLY AND WASTE. (*See* HUMAN BODY.)

SWEET POTATO (Case 8). *Substances illustrating the chemical analysis of one pound of Sweet Potato.*

The sweet potato (*Convolvulus Batatas*) is eaten largely in tropical America. It may be used as food as a substitute for the potato.

The ingredients in 1 lb. of sweet potato are shown as follows .—

a. 1 *lb. of sweet potato.*
b. 1 *lb. of sweet potato dried.*
1. Water in 1 lb. of sweet potato—10 oz. 340 gr.
2. Starch in 1 lb. of sweet potato—2 oz. 249 gr.
3. Sugar in 1 lb. of sweet potato—1 oz. 277 gr.
4. Albumenoid matter in 1 lb. of sweet potato—105 gr.
5. Fat in 1 lb. of sweet potato—18 gr.
6. Woody fibre in 1 lb. of sweet potato—35 gr.
7. Gum, &c., in 1 lb. of sweet potato—77 gr.
8. Mineral matter in 1 lb. of sweet potato—210 gr.

SWITZERLAND (Case 24). Examples of food and other remains collected from the peat of the Lacustrine habitations of Robenhausen, on the lake of Pfäffikon, canton of Zurich, Switzerland. — Presented (November 1860) by Dr. Charles T. Gaudin and M. Gabriel de Rumine, of Lausanne. The following is an extract from Dr. Gaudin's letter, received with the specimens:— " These remains have been found in a settlement where " no metal has been discovered, but where all the " implements are of stone, anterior to the use of either " bronze or iron. A great light is therefore thrown on " the agriculture of the remotest Celtic period. The " stone period not being confined to Switzerland, but " extending also to England, we hope you will kindly " accept these unique remains of the first inhabitants " of Europe. Villages built on pilotis, or pieces of wood " firmly fixed in the bottom and covered with a planking, " have been discovered during the last eight years in " almost every lake of Switzerland, Savoy, and Denmark. Some, the most ancient, have no implements " but those of stone ; others, more recent, belong to the " bronze period, and the latest to the iron age. Such " villages, also discovered of late in the Italian lakes, do " no doubt exist in the lakes of Cumberland, Westmorland, Scotland, and Ireland, at 100 or 200 yards from " the shore. It would be worth while to explore them,

"and collect the remains of industry belonging to the "first inhabitants of the British isles."

TABLES. (*See* DIAGRAMS.)

TAPE-WORM. (*See* DISEASED MEAT.)

TAPIOCA. (*See* STARCH.)

TEA (Case 46). *Substances illustrating the chemical analysis of one pound of Tea.*

Tea (*Thea Sinensis*) consists of the leaves of several varieties of a small shrub found in China and India. The leaves are gathered in the fourth year of the growth of the plant, which is generally dug up, and renewed in its tenth or twelfth year. The leaves are cropped with great care by gatherers. The differences between teas result partly from the varieties of soil and growth, but also from the mode of curing and drying the leaves. Black tea consists of leaves slightly fermented and twisted. Genuine green tea is made of exactly the same leaves, without fermentation; but commercial "green" teas are often black teas coloured with Prussian blue. Probably half the human race now use tea. The chief action of tea depends, firstly, on its volatile oil (less in old than in new teas), which is narcotic and intoxicating; and, secondly, on a peculiar crystalline principle, called THEINE. This principle excites the brain to increased activity; but retards the consumption of nitrogenous matter in the system, and so economises flesh-producing food. Four grains of Theine, contained in half an ounce of tea, act in this way; but if one ounce of tea, containing eight grains of Theine, be taken in a day by one person, then tremblings, irritability of temper, and wandering of thoughts ensue. When the system becomes thus saturated with Theine, it is useful to resort to cocoa as a beverage, for a few days, when the irritable symptoms subside and the use of tea may be resumed.

The tea-leaves, which become changed in the process of drying and preparation, resemble coffee in many points. They are rich in casein, but contain in the same weight nearly twice as much theine as coffee does caffeine The aromatic oil, which by itself is intoxicating, is present in greater quantity than in coffee.

100 parts of good tea contain:—

Water	5·00
Theine	3·00
Casein	15·00
Aromatic oil	0·75
Gum	18·00
Sugar	3·00
Fat	4·00
Tannic acid	26·25
Woody fibre	20·00
Mineral matter	5·00

or,

WATER	5·0
FLESH AND FORCE PRODUCERS	18·0
FORCE-PRODUCERS	72·0
MINERAL MATTER	5·0

The ingredients in 1 lb. of good tea are shown as follows:—

a. 1 *lb. of ordinary good tea.*
1. Water in 1 lb. of tea—350 gr.
2. Theine in 1 lb. of tea—210 gr.
3. Casein in 1 lb. of tea—2 oz. 175 gr.
4. Aromatic oil in 1 lb. of tea—52 gr.
5. Gum in 1 lb. of tea—2 oz. 385 gr.
6. Sugar in 1 lb. of tea—218 gr.
7. Fat in 1 lb. of tea—280 gr.
8. Tannic acid in 1 lb. of tea—4 oz. 87 gr.
9. Woody fibre in 1 lb. of tea—3 oz. 17 gr.
10. Mineral matter—350 gr.

TEA (Case 46). Commercial varieties of Chinese teas.—Presented by Messrs. Dakin and Co., St. Paul's Churchyard, London, E.C.

TEA (Case 48). A collection of samples of East Indian teas, portions of those exhibited by Dr. A. Campbell in the Indian division of the International Exhibition of 1862. —Presented by Dr. Lankester.

TEA (Case 48). A collection of samples of East Indian teas.—Presented by Dr. Forbes Watson.

TEA (Cases 47 and 99). A collection of samples of tea from Java.—Presented by the Commissioners for the Netherlands at the International Exhibition of 1862.

TEA (Case 47). A series of samples of tea cultivated in Brazil. Tea from Trinidad. Tea grown in Victoria, Australia.

TEA (Case 46). Sample of tea called "Tamsuy" tea, from Formosa.—Presented by R. Swinhoe, Esq.

TEA and COFFEE. Rations of tea and coffee, with milk and sugar, compressed by hydraulic pressure. For the use of emigrants and travellers. Given by the patentee, Mr. James Spratt.

TEA SUBSTITUTES (Case 49). Infusions from the leaves of many plants have been used as substitutes for tea, but few of them seem to contain the same alkaloid. Some of these are exhibited, others are represented by diagrams on the walls. The following are exhibited:—Swiss tea prepared from Alpine plants, Faham tea of the Mauritius, Lime flowers and leaves, New Jersey tea, Appalachian tea, Labrador tea, Maté or Paraguay tea, and dried portions of the plant producing it, from the Royal Gardens, Kew, with calabash and sucking pipe. Samples of "Heidelberg" tea, "Bosjes" tea, and "Hottentot" tea from the Cape of Good Hope, "Siderita," or wild tea from Greece, and various substances used as

tea from the French colonies of Réunion, Guiana, Gaboon, Martinique, Guadaloupe, and St. Pierre.

TOBACCO (Case 98). *Substances illustrating the chemical analysis of one pound of Tobacco.*

The active principle of tobacco is *Nicotine*, which varies from 2 per cent. in Havannah cigars, to 6 per cent. in Virginian "shag." The oil of tobacco is more abundant in new than in old tobacco. The quantity of sugar in tobacco varies from a trace in Maryland tobacco, to 5 per cent. in Turkish tobacco. The salts which constitute the ash vary very much in quantity, from 13 per cent. in Turkish tobacco, 28 per cent. in Missouri tobacco.

100 parts of the best "shag" tobacco contain:—

Nicotine	6·0	Woody fibre	40·0
Oil	0·1	Starch	4·0
Gum	8·0	Mineral matter	16·0
Albumen	5·0	Extractive matter	6·9
Sugar	2·0	Water	12·0

The proportions of the above ingredients in 1 lb. of "shag" tobacco, or cigars made from Virginian leaf are shown as follows:—

a. 1 *lb. of shag tobacco.*
b. 1 *lb. of cigars.*
1. Water in 1 lb. of tobacco—1 oz. 402 gr.
2. Nicotine in 1 lb. of tobacco—419 gr.
3. Oil in 1 lb. of tobacco—7 gr.
4. Gum in 1 lb. of tobacco—1 oz. 122 gr.
5. Albumen in 1 lb. of tobacco—349 gr.
6. Sugar in 1 lb. of tobacco—139 gr.
7. Starch in 1 lb. of tobacco—279 gr.
8. Extractive and coloring matter in 1 lb. of tobacco—1 oz. 46 gr.
9. Woody fibre in 1 lb. of tobacco—6 oz. 177 gr.
10. Mineral matter in 1 lb. of tobacco—2 oz. 245 gr.

Although tobacco has been only comparatively recently introduced amongst the inhabitants of the Old World it is more extensively employed than any other narcotic. It is the produce of various species of the genus *Nicotiana*. The practice of smoking the leaves of these plants was introduced from the New World. The species which supplies the greater proportion of the tobacco smoked in Europe is the *Nicotiana tabacum*, and is a native of America. The leaves of the tobacco plant contain an active principle called *Nicotine*, which has the properties of an alkaloid; they also contain a volatile oil. Both these substances possess narcotic properties, and act powerfully on the nervous system. In addition to these principles an empyreumatic oil is developed during the smoking, which assists their narcotic

action. The narcotic effects of tobacco are similar to those of alcohol, but tobacco is less intoxicating, and acts more powerfully, generally, on the nervous system. The species of tobacco indigenous in the Old World are *Nicotiana rustica* and *N. Persica*, inhabitants of the Levant and Persia, which supply only a limited quantity of the tobacco smoked in Europe. Tobacco is also used in the manufacture of snuff. For this purpose the stalks and ribs of the tobacco leaves are employed.

The excessive use of tobacco is attended with a disordered state of the nervous system, which may lead to dangerous and even fatal diseases.

TOBACCO (Cases 93 to 98). Samples of tobacco in the raw and manufactured state, including cigars and snuffs, from the following countries, namely:—France, French Colonies, Hungary, Germany, Greece, Sweden, Queensland New South Wales, Victoria, Java, Brazil, Havannah, East Indies, Corsica, Russia, United States of America. —Presented by the Commissioners for the countries named, International Exhibition of 1862.

TOBACCO (Case 97). Various samples of manufactured tobacco, cigars, and stalks for making snuff, &c.—Presented by Messrs. Lambert and Butler, Drury Lane, London.

TOBACCO. A roll of tobacco from Borha, Rio Negro, Brazil.—Presented by the Brazilian Commissioners, International Exhibition of 1862.

TOBACCO (Case 98). Two small samples of tobacco (with a pipe bowl in red clay) from Kurdistan and Shiraz.—Presented by C. A. Rassam, Esq., British Consul at Mosul, Persia.

TOBACCO (Case 80). Ship, in full rig, formed entirely of tobacco. This figure was part of the tobacco trophy in the French division of the International Exhibition of 1862.

TRUFFLES. (*See* FUNGI.)

TURNIPS (Case 11). *Substances illustrating the chemical analysis of one pound of Turnips.*

Like carrots and parsnips the turnip contains large quantities of water. It has more nutritive matter than the carrot, but less than the parsnip. It has less sugar than the carrot, but more than the parsnip; and less indigestible fibre than either parsnips or carrots.

In 100 parts it contains the following ingredients:—

Water	90·5	WATER	90·5
Albumen and Casein	1·1	FLESH AND FORCE PRODUCERS	1·1
Sugar	4·0	FORCE-PRODUCERS	7·9
Gum	1·5	MINERAL MATTER	0·5
Woody fibre	2·4		
Mineral matter	0·5		

The ingredients in 1 lb. of turnips are shown as follows:—

a. 1 *lb. of fresh turnips.*
b. 1 *lb. of dried turnips.*
1. Water in 1 lb. of turnips—14 oz. 213 gr.
2. Albumen and Casein in 1 lb. of turnips—77 gr.
3. Sugar in 1 lb. of turnips—280 gr.
4. Gum in 1 lb. of turnips—107 gr.
5. Woody fibre in 1 lb. of turnips—168 gr.
6. Mineral matter in 1 lb. of turnips—35 gr.

VANILLA. (*See* FLAVORERS.)

VEAL. (*See* FLESH USED AS FOOD.)

* VEGETABLE FOOD. The comparative chemical composition of vegetable food is presented to the eye in these cases, and exhibits the quantities of water, ashes, force-producer and flesh and force producers in a pound of wheat, barley, oats, rice, rye, maize, beans, peas, lentils, buck-wheat, and potatoes.

VERMICELLI. (*See* MACCARONI.)

VINE CULTURE (Case 37). In this case are exhibited the stems of eight vines, with artificial foliage and fruit, in illustration of the mode of cultivation in France. Also some of the soil in which the stems exhibited grew.—Presented by the French Commissioners, International Exhibition of 1862.

VINEGAR. (*See* ACIDS.)

VINIFERÆ (Cases 14 and 15). (*See* also GRAPES, or dried fruits of the grape vine). Various samples of raisins, muscatels, currants, and sultanas, from Patras, Cephalonia, Zante, Gulph of Salomea, Vostizza, Spain, Naples, Persia, and Turkey.—Presented by Messrs. Fortnum and Mason.

WATER. The first and most essential constituent of food is water. Three-fourths of the body are composed of water, and it is by the agency of water that all kinds of food are taken up into the system. Solid food contains large proportions of water; but in proportion to the dryness of food, water should be added to it, in the form of some kind of beverage.

* Not at present shown.

Quantities of Water in 100 Pounds of different kinds of Solid Food.

Vegetable Food.

	lbs.		lbs.
Cocoa - - -	- 5	Barley meal - -	- 14
Rye - - -	- 13	Flour - - -	- 14
Rice - - -	- 13	Bread - - -	- 44
Oatmeal - -	- 13	Potatoes - -	- 75
Indian meal - -	- 14	Parsnips - -	- 79
Peas - - -	- 14	Mangel wurzel -	- 85
Beans - - -	- 14	Carrots - -	- 86
Lentils - - -	- 14	Turnips - -	- 87
Buckwheat - -	- 14	Cabbage - -	- 92

Animal Food.

	lbs.		lbs.
Bacon - - -	- 30	Lamb - - -	- 50
Pork - - -	- 38	Veal - - -	- 62
Cheese - - -	- 40	Fish - - -	- 78
Mutton - - -	- 44	Eggs - - -	- 80
Beef - - -	- 50	Milk - - -	- 86

An imperial gallon of water weighs 10 lbs. avoirdupois.

Water for dietetical purposes is obtained principally from four sources:—1. Rivers; 2. Springs; 3. Shallow or surface wells; 4. Deep or artesian wells. Water from all four sources contains saline or mineral matters in solution, and, provided they are not in quantities so large as to act injuriously on the system, water may become a source of supply of these constituents to the body.

Besides these *inorganic* substances, water contains *organic* matters arising from the decomposition of animal and vegetable substances, either growing in the water or cast into it. This organic matter, when of animal origin, may render the water in which it is present very injurious, and even fatal, in its effects.

Specimens of Thames water, taken at various points on the river, from Southend to Thames Ditton, are exhibited, to show the influence of the sewage of London in rendering the water unfit for drinking purposes.

A series of specimens of waters from the surface wells of the parish of Saint James, Westminster, are also exhibited, which show the large quantities of organic matter contained in these surface wells. Drinking fountains, erected to supply filtered river water, are a great improvement on this kind of water.

Water from the chalk or limestone is generally hard, arising from its holding in solution carbonate of lime, which, although insoluble in water, is dissolved by the agency of carbonic acid. By Clark's softening process the

carbonic acid is neutralized by lime, and the carbonate of lime is thus thrown down. Specimens are exhibited.

Water is frequently stored in leaden cisterns, and when free from carbonic and phosphoric acids it acts powerfully on lead. Thus distilled water becomes speedily tainted with lead, whilst Thames water and London surface well water act but slightly upon it. Specimens of these and other waters acting upon lead are exhibited in the Collection.

London is, at present, supplied with water by nine companies, who deliver about 108,000,000 gallons daily. Some idea may be formed of the vastness of this supply by a comparison of its volume with some well-known magnitude. If it were contained in a reservoir having a floor area equal to that of Westminster Hall, the walls would require to be carried to the height of 1,070 feet, or more than three times the height of the Victoria Tower, to enable it to contain the water which is daily distributed in the metropolis. Five of the water companies abstract about one-half of the total supply from the Thames, two withdraw about 42,000,000 gallons from the river Lea, and the remainder is pumped by two other companies (the Kent and South Essex Companies) from artesian wells sunk into the chalk of the Thames basin. Such is the present volume of water daily supplied to London and its suburbs; what will be the amount required twenty years hence it is difficult to estimate, but if the annual rate of increase since 1850 be continued, it can scarcely be less than 150,000,000 of gallons; for, in 1850, the gross daily quantity delivered was only 44½ millions of gallons, in 1856 it had reached 81,000,000 of gallons, whilst in 1868 it was 108,000,000 of gallons.

The most important things to be ascertained, by chemical analysis, about a water used for domestic purposes are, first, the amount and character of the organic matter present; and, secondly, the amount of hardening or soap-destroying materials which the water contains. Unfortunately the first of these data cannot be ascertained, but two of the most important elements of organic matter, carbon and nitrogen, can be determined with precision.

The organic matters containing nitrogen which occur, dissolved in water, are chiefly of animal origin, being derived either from sewage or manured land. After admixture with spring or river water, these noxious organic matters undergo slow oxidation, by which they are finally resolved into comparatively innocuous mineral compounds; their carbon is converted into carbonic acid, and their hydrogen into water, and these products can no longer be

identified in the aërated waters of the river or spring; but the nitrogen is converted into nitrous and nitric acids, which combining with the bases contained in most waters, remain dissolved, and constitute a record of the sewage or other analogous contamination to which the water has been subjected. They may be regarded, in fact, as the skeleton of decomposed sewage or manure. With certain corrections presently to be mentioned, the analytical determination of the nitrogen contained in these salts, and in the form of ammonia, writes, as it were, the history of the water as regards its contact with decomposing animal matter. Such *previous organic contamination* may be conveniently expressed in parts of average filtered London sewage, which, if thus completely oxidized in a river, would yield a like amount of nitrogen in the form of nitrites, nitrates, and ammonia. For this purpose average filtered London sewage may be taken as containing 10 parts of combined nitrogen in 100,000 parts, as deduced from the numerous analyses of Way, Hofmann, and Witt. The number so obtained as the *previous sewage contamination* of a water requires, however, a correction, since rain water itself contains combined nitrogen, as ammonia, nitrite of ammonia, and nitrate of ammonia, to the extent of ·032 part in 100,000 parts of water.

The results of the examination of various waters contained in the following table further illustrate this point:—

Previous Sewage or Manure Contamination in 100,000 Parts of various Waters.

Names of Waters.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Previous Sewage Contam.
Thames water as delivered in London -	·002	·234	2,062
Water delivered by Kent Company - -	·001	·408	3,770
Water supplied to Worthing - -	·000	·426	3,940
Water delivered by South Essex Company -	·006	·848	8,205
Shallow well at Leyland, near Preston -	·003	2·466	24,366
Shallow well at Ledbury - - -	·001	1·575	15,440
Shallow well at Redhill - - -	·002	1·446	14,160
Pump at Aldgate - - - -	—	—	38,080
Pump at Minories - - - -	—	—	57,060
Pump at Leadenhall Market - -	—	—	57,370
Pump at St. Nicholas Olave Churchyard -	—	—	75,640
Well in the Rue Traversine, Paris - -	—	—	299,780
Royal Institution well water - - -	·001	4·355	43,240

The above results show the greatest previous sewage contamination precisely in those cases where it would be predicted; thus the shallow well water of Leyland, near Preston, consists almost entirely of the drainage from cess-

pools and market gardens, the latter being heavily manured with night-soil, farm-yard manure, and guano. It need, therefore, excite no surprise that nearly 25 per cent. of this water has been in a condition equivalent to average London sewage. The quality of the waters taken from the City pumps and from the well in the Royal Institution needs no comment; these shallow wells are now recognized as being fed by oxidized and somewhat diluted sewage. But in the well of the Rue Traversine, in Paris, this kind of contamination reaches, perhaps, its maximum. The cesspool system is still in full activity in Paris, and the soil of that city is saturated with liquid manure of such a strength that one gallon of it is equivalent to three gallons of average London sewage.

But what is the import of this previous sewage contamination? These skeleton compounds are innocuous; why trouble ourselves about them? True; they are innocuous, or nearly so; but inasmuch as they show that the water has been in contact with animal refuse, they bring a heavy charge of suspicion against it. These refuse animal matters are known to contain frequently that which is hurtful to human life. This hurtful matter is believed, on very strong evidence, to consist of spores or germs of organisms which are capable, under favourable circumstances, of producing in man such diseases as cholera, typhoid fever, and dysentery. Now such spores or germs, endowed as they are with vitality, will be likely to resist the oxidizing agencies which convert the rest of the animal refuse into nitric acid, nitrous acid, and ammonia. For instance, if the contents of an egg were beaten up with water, and poured into the Thames at Oxford, the organic matter would probably be entirely oxidized and converted into mineral compounds before it reached Teddington; but if the egg were thrown whole into the Thames at Oxford it would, if it retained its vitality, be carried down to Teddington without any decomposition of its organic matter. There can be no doubt that the spores or germs of many organisms are in like manner capable of resisting for a long time the decomposing action of water. Now, no practicable process is known by which these spores, once introduced into water, can be again removed, or their vitality destroyed. Filtration will not do it; for in the account of his researches on vaccine, glanders, and small-pox poisons, recently communicated to the Academy of Sciences, M. Chauveau says, regarding the organic germs which constitute these poisons, "they pass through all filters."

Boiling even for several hours cannot be relied upon for the destruction of such germs, some of which have recently been shown to retain their vitality after four hours' boiling

Nothing short of distillation, therefore, as it is carried on in nature, can be relied upon to free completely sewage contaminated water from its noxious constituents. Excessive filtration is, doubtless, to some extent a safeguard, and hence previous sewage contamination in deep well water, if we could be certain that the water had fairly filtered through some 100 feet of strata, and that none of it gained access to the wells through fissures or swallow-holes, would have far less significance than it has in the case of a river water, where the fine suspended and noxious matters of sewage have but a comparatively slender chance of removal before the water reaches the consumer. We must, however, not forget that mere dilution fails, in the case of these suspended germs, to destroy their noxious quality, differing as they do, in this respect remarkably, from soluble poisons. Water once contaminated with sewage or manure matter ought therefore never to be used for domestic purposes if any other supply can be obtained.

Of the mineral impurities present in water, the most important are the soap-destroying category of substances which communicate to water the quality termed hardness. From a purely sanitary point of view they are of less direct importance than the organic impurities; still, by rendering efficient ablution and thorough cleanliness difficult of attainment, they doubtless indirectly affect the health of communities supplied with waters in which they are present in considerable quantities. The chief hardening ingredients in potable waters are the salts of lime and magnesia. These salts decompose soap, forming curdy and insoluble compounds containing the fatty acids of the soap, and the lime and magnesia of the salts.

So long as this decomposition goes on, the soap fails to produce a frothiness in the water, but when all the lime and magnesia salts have been decomposed by the action of the soap, the slightest further addition of the latter produces a lather when the water is agitated, but this lather is again destroyed by the addition of a further quantity of the hard water. Thus, the addition of hard water to a solution of soap—or the reverse of this operation—causes the production of the insoluble curdy matter above mentioned. Bearing this in mind, it is easy to understand the process of washing the skin with soap and hard water, which may be thus described:—First, the skin is wetted with the water, then soap is applied; the latter soon decomposes all the hardening salts contained in the small quantity of water with which the skin is wetted, and there is then formed a strong solution of soap, which penetrates

into the pores of the skin. This is the process which goes on whilst a lather is produced in washing, but now the lather requires to be removed from the skin. How can this be done? Obviously only in one of two ways, viz. by wiping it off with a towel or by rinsing it away with water. In the former case the pores of the skin are left filled with soap solution, in the latter they become plugged up with the greasy, curdy matter which results from the action of the hard water upon the soap solution occupying the pores of the cuticle. As the latter process of removing the lather is the one universally adopted, the operation of washing with soap and hard water is perfectly analogous to that used by the dyer or calico-printer when he wishes to fix a pigment in the pores of any tissue. He first introduces into the tubes of the fibre of calico, for instance, a liquid containing one of the ingredients necessary for the formation of the insoluble pigment; this is then followed by another liquid containing the remaining necessary ingredients; the insoluble pigment is then produced within the very tubes of the cotton fibre, and is thus imprisoned in such a manner as to defy removal by subsequent washing. The process of ablution, therefore, in hard water, is essentially one of dyeing the skin with the white, insoluble, greasy and curdy salts of the fatty acids contained in soap. The pores of the skin are thus blocked up, and it is only because the insoluble pigment produced is white that such a repulsive operation is tolerated. To those, however who have been accustomed to wash in soft water, the abnormal condition of the skin thus induced is, for a long time, extremely unpleasant.

The amount of soap destroyed by the use of various waters for washing purposes is seen from the following table:—

SOAP destroyed by 100,000 lbs. of various WATERS.

	Soap destroyed. lbs.
Metropolitan Waters—	
Thames water	212
River Lee	204
Kent Company's water	265
Other Waters—	
South Essex Company's water	253
Caterham Company's water	84
Water supply of Worthing	285
,, ,, Leicester	161
,, ,, Manchester	32
,, ,, Preston	80
,, ,, Glasgow (Loch Katrine)	4
,, ,, Lancaster	1

The Registrar-General publishes monthly the analysis of the waters supplied to the metropolis. The following table shows the analytical results for October 1868:—

RESULTS of ANALYSIS expressed in Parts per 100,000.

Description.	Total solid Impurity.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen as Nitrates and Nitrites.	Total combined Nitrogen.	Previous Sewage Contamination.	Hardness.
METROPOLITAN WATERS.								
Thames Waters.								
Chelsea Company's water - -	29·2	·213	·040	·002	·337	·379	3,070	21·6
West Middlesex „ - -	25·6	·205	·019	·001	·159	·179	1,280	19·4
Southwark „ - -	33·6	·273	·042	·002	·227	·271	1,970	19·5
Grand Junction „ - -	29·6	·236	·039	·002	·267	·308	2,370	20·8
Lambeth „ - -	30·8	·225	·035	·002	·435	·472	4,050	20·6
Other Sources.								
New River Company's water -	25·8	·050	·013	·000	·190	·203	1,580	21·1
East London „ -	24·4	·061	·019	·000	·075	·094	430	19·3
Kent „ -	40·2	·034	·006	·000	·396	·402	3,700	27·0
PROVINCIAL WATERS.								
Glasgow water supply - -	3·0	·161	·011	·001	·000	·012	0	0·3
Lancaster „ - -	3·5	·157	·001	·001	·036	·038	50	0·1
Manchester „ - -	6·2	·183	·009	·006	·025	·039	0	3·7
Preston „ - -	14·7	·515	·040	·003	·001	·044	0	6·7

The table is to be read thus:—100,000 lbs. of Chelsea water contained 29·2 lbs. of solid impurity; the organic matter constituting a portion of this impurity contained ·213 lb. of carbon, and ·04 lb. of nitrogen. This solid impurity also contained ·337 lb. of nitrogen in the form of nitrates and nitrites, besides ·002 lb. of ammonia, whilst the total amount of *combined* nitrogen in every form was ·379 lb. The above quantity of water supplied by the Chelsea Company had been, after its descent to the earth as rain, contaminated with sewage or manure matter equivalent to 3,070 lbs. of average filtered London sewage.

By gradual oxidation, partly in the pores of the soil, partly in the Thames or its tributaries, and partly in the reservoirs, filters, and conduits of the Company, this sewage contamination had been entirely converted into comparatively innocuous inorganic compounds before its delivery to consumers. Finally, 100,000 lbs. of the Chelsea Company's water contained 21·6 lbs. of carbonate of lime, or an equivalent quantity of other soap-destroying

The influence of impure water in spreading certain epidemic diseases is thus described by Mr. Simon, the Medical Officer of the Privy Council, in his report on the cholera visitation of 1866:—

"It cannot be too distinctly understood that the person who contracts cholera in this country is *ipso facto* demonstrated with almost absolute certainty to have been exposed to excremental pollution; that what gave him cholera was (mediately or immediately) cholera-contagium discharged from another's bowels; that, in short, the diffusion of cholera among us depends entirely upon the numberless filthy facilities which are let exist, and especially in our larger towns, for the fouling of earth and air and water, and thus secondarily for the infection of man, with whatever contagium may be contained in the miscellaneous outflowings of the population. Excrement-sodden earth, excrement-reeking air, excrement-tainted water, these are for us the causes of cholera. That they respectively act only in so far as the excrement is cholera-excrement, and that cholera-excrement again only acts in so far as it contains certain microscopical fungi, may be the truest of all true propositions; but whatever be their abstract truth, their separate application is impossible. Nowhere out of Laputa could there be serious thought of differentiating excremental performances into groups of diarrhœal and healthy, or of using the highest powers of the microscope to identify the cylindro-taenium for extermination. It is excrement, indiscriminately, which must be kept from fouling us with its decay.

"And thus it is that my practical advice remains substantially what it has been for years. The local conditions of safety are, above all, these two:—(1) that, by appropriate structural works, all the excremental produce of the population shall be so promptly and so thoroughly removed that the inhabited place, in its air and soil, shall be absolutely without fæcal impurities; and (2) that the water supply of the population shall be derived from such sources, and conveyed in such channels, that its contamination by excrement is impossible.

"What good results are got even by rough approximation to those sanitary standards has already been abundantly shown here. The way in which the southern districts of London, with their three-fourths of a million of population, have gradually gained *comparative* immunity from cholera *in proportion* as their two water companies have ceased to distribute sewage-tainted water among them, is a matter of familiar history.

"That cholera is still a terror to Europe shows how scantily such illustrations are yet understood. Even here in England the objects which I have named as essential are at best but rarely fulfilled; indeed for vast numbers of our population scarcely rudimentary endeavours have been made to attain them. Town after town might be named, with myriad on myriad of population, where there is little more structural arrangement for the removal of refuse than if the inhabitants were but tented there for a night. The case of the water supply is no better: my reports are incessantly showing the too frequent foulness of private supplies; while, as regards public water supplies, such as generally are in the hands of commercial companies, it has again and again been shown (and seldom more pointedly than in the present volume), that their conveniences and advantages are countervailed by dangers to life on a scale of gigantic magnitude, unless those who administer the supplies act under a very deep sense of responsibility.

"Cholera, ravaging here at long intervals, is not Nature's only retribution for our neglect in such matters as are in question. Typhoid

fever and much endemic diarrhœa are, as I have often reported, incessant witnesses to the same deleterious influence; typhoid fever which annually kills some 15,000 to 20,000 of our population, and diarrhœa which kills many thousands besides. The mere quantity of this wasted life is something horrible to contemplate, and the mode in which the waste is caused is surely nothing less than shameful. It is to be hoped that, as the education of the country advances, this sort of thing will come to an end; that so much preventible death will not always be accepted as a fate; that for a population to be thus poisoned by its own excrement will some day be deemed ignominious and intolerable."

Test of the purity of water.—No single test is known by which the purity or foulness of water can be ascertained with certainty, but permanganate of potash, dissolved in water, may be used as a rough and ready test of purity. The solution of permanganate has a rich pink colour which is destroyed by organic matter in water.

If a clear and colourless water decolorizes much of the permanganate solution, the water ought to be rejected for domestic use, as being of *doubtful* quality; for although such a water may be absolutely free from organic impurity, yet its decolorizing action upon the permanganate would indicate, with considerable certainty, that the water had been in contact with decaying animal matters. Should the water, however, instead of being colourless, be tinged of a yellow or brownish yellow colour, when looked at through a considerable stratum, as in a decanter, for instance, its capability of decolorizing a considerable amount of permanganate solution ought not to be regarded with the same suspicion as in the case of a colourless water, because the yellow tint of such waters is generally owing to the presence of peaty matter, which, though innocuous, has the power of decolorizing permanganate of potash.

Various samples of water tested by permanganate are exhibited. The waters thus tested are renewed *every month.*

WATER. *Conversion of sea-water into fresh-water.* Diagram representing the apparatus invented by Dr. Normandy, for converting sea water into aërated fresh water. Samples of such water are exhibited.—Presented by the late Dr. Normandy.

WATER. A series of evaporating basins, illustrating the difference between the deposit left after evaporation of pure and impure waters.—Presented by Dr. Medlock.

WATER. A series of samples of water containing lead, lime, sulphates, and chlorides, with various tests for ascertaining their presence; also a set of other samples treated with the "soap test," to ascertain their degrees of hardness.

WATER. The "Gazogene." An apparatus for charging water with carbonic acid gas, for drinking purposes. This is effected by generating carbonic acid from a carbonate in the lower vessel, which passes to the upper one, and thus aërates the water. This process renders brisk and lively, water that has been boiled or distilled, or has in any way lost its aëriform constituents.

WHEAT (Case 26). (*See* also CEREALS.) *Substances illustrating the chemical analysis of one pound of Wheat.*

The plants yielding wheat belong to the natural order of grasses (*graminaceæ*). They have never been found in a perfectly wild state, and on that account have been supposed to originate in some other form of grass at present wild. Although surmises have been made that the wheats originate in a wild plant called *ægilops ovata*, the fact of the conversion of one into the other has not yet been proved. The wheat plant is grown all over the world, but flourishes mostly between the parallels of 25 and 60 degrees of latitude. It is more abundant in the northern than in the southern hemisphere.

The varieties of wheat cultivated in Europe may be divided into those whose flowers produce awns, and those without these appendages, or *bearded* and *beardless* wheats The fruits or seeds of these varieties are red or white, hence a further subdivision takes place into *red* or *white*, bearded or beardless, wheats. Amongst the red bearded varieties is the fingered Egyptian or mummy wheat, which presents the peculiarity of several branches bearing fruits proceeding from its central stalk. Wheat is also called hard and soft according to its consistence, and winter and spring as it is sown at those seasons of the year. The red varieties yield the largest amount of grain, but the white the whitest flour.

Wheat is preferred to the other cereal grasses as an article of food on account of its containing a larger quantity of flesh and force-producing matters. The flour also may be rendered very white by separating it from the husks, or bran, and the fruit is much more easily separated from the chaff than is the case with the other cereals. The proportion of flesh-forming matters to those which produce force only are more nearly adjusted to the requirements of the system in wheat than in any other food. Hence, probably, its very general use as an article of food amongst the populations of the hardest-working nations in the world.

Good wheat should give three-fourths of its weight of fine flour; but the chemical composition of this depends upon the greater or less quantity which it contains of the outer husks. The finest flour is not so rich in flesh-forming matter as the coarser kinds.

The average composition in 100 parts may be taken as:—

Water	14·0	WATER	14·0
Gluten	12·8	FLESH AND FORCE PRODUCERS	14·6
Albumen	1·8		
Starch	59·7	FORCE-PRODUCERS	69·8
Sugar	5·5	MINERAL MATTER	1·6
Gum	1·7		
Fat	1·2		
Woody fibre	1·7		
Mineral matter	1·6		

The ingredients in 1 lb. of wheat are shown in the case as follows:—

a. *Wheat, of which the chemical composition varies according to the varieties; 21 oz. required to make 1 lb. of flour.*

b. *Bran, or outer and inner skins of the wheat—5 oz. 106 gr.*

c. *Flour, or the inner part of wheat separated from the outer parts or bran—16 oz.*

1. Water in 1 lb. of flour—2 oz. 106 gr.
2. Gluten in 1 lb. of flour—2 oz. 21 gr.
3. Albumen in 1 lb. of flour—126 gr.
4. Starch in 1 lb. of flour—9 oz. 242 gr.
5. Sugar in 1 lb. of flour—385 gr.
6. Gum in 1 lb. of flour—119 gr.
7. Fat in 1 lb. of flour—84 gr.
8. Woody fibre in 1 lb. of flour—119 gr.
9. Mineral matter in 1 lb. of flour—112 gr.

One pound of good wheaten flour, when digested and oxidized in the body, is capable of producing a force equal to 2,383 tons raised one foot high. The maximum of work which it will enable a man to perform is 477 tons raised one foot high. One pound of flour can produce at the maximum 2¼ oz. of dry muscle or flesh.

WHEAT. Frame containing 104 varieties of wheat cultivated in Great Britain and elsewhere.—Presented by Colonel Le Couteur, of Jersey.

WHEAT. Samples of the various products obtained from wheat, and the quantities of flour, pollard, and bran obtained from half a peck of wheat.—Presented by Messrs. Horsnaill and Catchpool.

WHEAT, diseases of. (*See* DIAGRAMS.) Wheat is subject to the attacks of several forms of fungi, as seen in the diagrams. They are known to the farmer by the name of *rust, mildew, smut,* and *bunt.*

WHEATEN BRAN (Case 26). *Substances illustrating the chemical analysis of one pound of Wheaten Bran.*

Bran is that portion of the grain of wheat which is separated when wheat flour is made. It contains less starch and sugar than wheat flour, but more gluten, fat, ashes, and woody fibre. Bread is more wholesome and

nutritious when the bran is left in, and brown bread should be eaten both on account of health and economy.

100 parts contain :—

Water	13·8	or,	WATER	13·8
Gluten	14·9		FLESH AND FORCE PRODUCERS	14·9
Starch	52·0		FORCE-PRODUCERS	66·3
Sugar	1·0		MINERAL MATTER	5·0
Fat	3·6			
Woody fibre	9·7			
Mineral matter	5·0			

With the gluten is included a nitrogenous principle called *cerealin*, which acts as a ferment, and assists in the digestion of the other substances.

The ingredients of 1 lb. of bran are shown as follows :—

a. 1 *lb. of bran.*
1. Water in 1 lb. of bran—2 oz. 92 gr.
2. Gluten and cerealin in 1 lb. of bran—2 oz. 169 gr.
3. Starch in 1 lb. of bran—8 oz. 128 gr.
4. Sugar in 1 lb. of bran—70 gr.
5. Fat in 1 lb. of bran—252 gr.
6. Woody fibre in 1 lb. of bran—1 oz. 242 gr.
7. Mineral matter in 1 lb. of bran—358 gr.

WHISKEY. (*See* DISTILLED SPIRITS.)

WINES (Case 36). The composition of various sorts of wine is shown in this case.

Wines are prepared by the dried fermentation of the sugar which exists in the juices of fruits. The wines of Europe are mostly made from the juice of the grape, which before fermentation is called "must." Wines vary according to the quantities of sugar, alcohol, and acid they contain. When wines contain much sugar they are called "sweet," when little "dry." The quantity of alcohol depends on the amount of sugar changed during fermentation. It is frequently added to wines to give them strength, as in port, sherry, and madeira. Clarets, hocks, and the light wines of the continent will not bear the addition of alcohol. The acid in wines made from grapes is tartaric. It forms a slightly soluble salt with potash, which is the tartar of the lees of wine, and thus wine is freed from too much acidity. The colour of red wines depends on a very small quantity of colouring matter contained in the grape. The market value of wines depends to a great extent on the development of a variety of chemical compounds, which are formed during their fermentation and keeping. These form the "bouquet" or peculiar flavour of wines. Some of these compounds, as œnanthic ether, occur in all wines. Others, as acetic, buty-

ric, caprylic ethers, and oxide of amyl, are only found in old wines; whilst some are peculiar to the wines of particular districts, as the flavoring principle of the muscatel grape.

The following table gives the quantities of alcohol, sugar, and acid contained in the wines which are most commonly consumed in Europe, samples of which are exhibited. One imperial pint of each of the following wines contains :—

Wines.	Water.	Alcohol.	Sugar.		Tartaric Acid.
	ozs.	ozs.	ozs.	grs.	grs.
Port - - - -	16	4	1	2	80
Brown Sherry - -	15½	4½	0	360	90
Pale Sherry - - -	16	4	0	80	170
Claret - - -	18	2	0	0	161
Burgundy - - -	17½	2½	0	0	160
Hock - - - -	17¾	2¼	0	0	127
Moselle - - -	18¼	1¾	0	0	140
Champagne - - -	17	3	1	133	90
Madeira - - -	16	4	0	400	100

Wines are made in this country from oranges, raisins, gooseberries, currants, elder berries, and other fruits. They contain other acids besides tartaric, which are not thrown down as insoluble salts; hence the necessity of adding to them large quantities of sugar, to cover the taste of the acid. The sugar in this case is in a readily fermentible condition, hence these wines cannot be taken in large quantities with the same impunity as wines holding less sugar in solution.

Wines, British (Case 38). Various samples of British wines.—Presented by the makers, Messrs. Walker and Walton.

Wines, British (Case 38). Various samples of British wines and fruit essences.—Presented by Mr. F. Wright, High Street, Kensington.

Woody Fibre. (*See* Force-producers in Food.)

Yam (Case 8). *Substances illustrating the chemical analysis of one pound of Yam (Dioscorea Japonica).*

Yams are the roots of several species of *Dioscorea.* Those from tropical America are the largest, and are the produce of the *Dioscorea sativa.* The *Dioscorea alata* yields the yams of the East Indies. A species is cultivated in France, Algeria, and China, known by the name of *Dioscorea Japonica,* of which the following analysis gives the composition.

This yam contains more nutritive matter, but less starch, than an equal bulk of potatoes.

100 parts of yam contain :—

Water	82·6	or,	WATER - - - 82·6
Starch	13·1		FLESH AND FORCE PRODUCERS - 2·4
Albumen	2·4		FORCE-PRODUCERS - 13·7
Fat	0·2		MINERAL MATTER 1·3
Woody fibre	0·4		
Mineral matter	1·3		

The ingredients in 1 lb. of yam are shown as follows :—

a. *1 lb. of yam.*
b. *1 lb. of yam dried.*
1. Water in 1 lb. of yam—13 oz.
2. Starch in 1 lb. of yam—2 oz. 127 gr.
3. Albumen in 1 lb. of yam—176 gr.
4. Fat in 1 lb. of yam—15 gr.
5. Woody fibre in 1 lb. of yam—30 gr.
6. Mineral matter in 1 lb. of yam—89 gr.

LONDON:
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.
For Her Majesty's Stationery Office.
[.—250.—6/72.]